APRIL, 1955 Vol. 44, No. 4

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

Marvelous are the things done . . .

Emerging from dubious antecedents, hypnotism is beginning to be recognized for what it can genuinely do . . . and for what it genuinely is. Hypnotism is merely suggestion according to most psychologists, and the marvelous feats performed during the "spell" simply dramatize the great power possessed by suggestion. But these exploits do not begin to tell of the extent to which suggestion is present in everyday life, or the extent to which men respond and are shaped by it.

In hypnotism, the subject agrees in advance to accept the preliminary suggestions of the hypnotist — and in so doing permits the operator later on to establish and control the content of the subject's mind.

The same thing happens when a person goes to a movie: he agrees in advance to accept what the movie announces, and as the picture unfolds, it establishes and controls the content of the person's mind.

And, in fact, when a boy comes to school he too is agreeing in advance to accept the educator's approach. Not that the educator strives to establish and control the content of the lad's mind but by subtle suggestion and impression he seeks to lead the youngster to the point where the *boy* establishes and controls the content of *his* mind. And when this is done right, there need be no further worry about the future outcome.

But just as hypnotist and movie maker are consistent so that no seeming contradiction breaks the *rapport*, so by consistent respect for his subject, for its outcome, for the students in his care, for the work they do, the educator must reinforce the hold he has on the youngster's enthusiasm, zeal, imagination and belief.

No instructor in mechanical drafting will risk vitiating all he has taught and all he will teach, by saying it does not matter whether the student work with cheap and childish drafting instruments. Rather, he insists upon full, honorable quality, full craftsmanship, worthy of the ends of the work and the great careers to which it can lead. This is the climax and *denouement* of *that story*. Nothing must prevent its being told to the end.

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SPECIAL INTRODUCTORY OFFER—A sample copy of this new $2.00 South Bend Project Book and a copy of newly revised Edition 53, "How to Run a Lathe", (total value $2.50) will be sent postpaid to any shop instructor or supervisor for only $1.00.

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APRIL
1955

VOL. 44 NO. 4

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

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This Month's Cover

Joseph Longo, machine shop instructor at the School of Vocational and Adult Education, Marinette, Wis., is demonstrating the use of the lathe to his students. The boys pictured are Donald Denowski, Lee Sanborn, and James Collins.

The photograph was submitted by Mr. Longo.

For a complete story on the new shop annex at the Marinette school, see Mr. Longo's article on page 76 of the March, 1955, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine.

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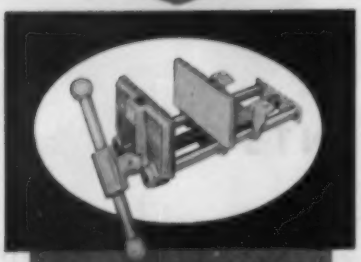

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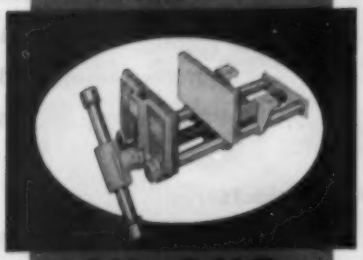

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Association News

COMING CONVENTIONS

Mar. 18–19. California Industrial Education Association, at San Diego, Calif. Secretary, Lee D. Bodkin, 131 Education Bldg., University of California, Los Angeles, Calif.

Mar. 25. Alabama Vocational Association, at Phillips High Schol, Birmingham, Ala. Secretary, H. R. Culver, Thach Hall, Auburn, Ala.

Mar. 30–Apr. 2. American Camping Association. Regional, at Peabody College, Nashville, Tenn. Chairman, Henry Hart, department of conservation, Nashville, Tenn.

Apr. 3–7. American Personnel and Guidance Association, at Conrad Hilton Hotel, Chicago, Ill. President, Donald Kitch, chief, Bureau of Guidance, State Department of Education, Sacramento, Calif.

Apr. 11–16. Eastern Arts Association, at Hotel Statler, Cleveland, Ohio. Secretary, Lillian D. Sweigart, State Teachers College, Kutztown, Pa.

Apr. 11–16. National Art Education Association, at Hotel Statler, Cleveland, Ohio. Secretary, Dr. Horace F. Heilman, Professor, Art Education, State Teachers College, Kutztown, Pa.

Apr. 14. New York State Steering Committee for Industrial Arts, at Hotel Utica, Utica, N. Y. Secretary, Richard Enders, Cold Spring Road R.D. No. 3, Baldwinsville, N. Y.

Apr. 14–16. New York State Vocational and Practical Arts Association, at Hotel Utica, Utica, N. Y. Secretary, Reno S. Knouse, New York State College for Teachers, Albany, N. Y.

Apr. 15. Industrial Education Conference, at Memorial Union, Iowa State College, Ames, Iowa. Secretary, Lowell L. Carver, 101 Industrial Arts Bldg., Iowa State College, Ames, Iowa.

Apr. 15–16. West Virginia Industrial Arts Association, at Mt. Vernon Hall, Jackson's Mill, W. Va. Vice-president, Lawrence E. Hayes, 380 Noyes Ave., Charleston, W. Va.

Apr. 15–16. Missouri Industrial Education Association, at University of Missouri, Columbia, Mo. Secretary, Maurice L. Stewart, Nevada High School, Nevada, Mo.

Apr. 16. Utah Industrial Arts Association, at Ben Lomond High School, Ogden, Utah. Leonard W. Glismann, director of Industrial Arts Education, Salt Lake City, Utah.

Apr. 18–22. Department of Audio-Visual Instruction (NEA), at Biltmore Hotel, Los Angeles, Calif.

Apr. 22–23. Connecticut Industrial Arts Association, at Henry Barnard Hall, Teachers College of Connecticut, New Britain, Conn. Secretary, Robert C. Wason, 98 Long Hill Drive, Stamford, Conn.

Apr. 23. Colorado Industrial Arts Association, at Colorado A. & M. College, Fort Collins, Colo. Secretary, Harold W. Underhill, 3333 E. Colorado Ave., Denver, Colo.

Apr. 23. Nebraska Industrial Education Association, at Northeast High School, 720 So. 22nd, Lincoln, Neb. Secretary, A. W. Brophy, 3124 N. 50th, Lincoln, Neb.

Apr. 25–30. American Industrial Arts Association, at Haddon Hall, Atlantic City, N. J. Secretary, Kenneth W. Brown, P.O. Box 2350, Buffalo 23, N. Y.

Apr. 29–30. Wisconsin Association for Vocational and Adult Education, at Schroeder Hotel, Milwaukee, Wis. Secretary, C. D. Rejahl, Commercial State Bank Bldg., Room 211, Madison, Wis.

BALL STATE TEACHERS CONFERENCE

The Ball State Teachers College Industrial Arts Department, Muncie, Ind., is having a spring industrial-arts conference for teachers and students of Indiana on Friday, April 15, 1955. Registration, a general assembly, and sectional meetings will constitute the morning program, followed by shop demonstrations in the afternoon. — *Henry A. Loats.*

MAINE ASSOCIATION FOR INDUSTRIAL EDUCATION

The officers for the Maine Association for Industrial Education for the year 1955–56, are: president, Norbert W. Young, Pittsfield; vice-president, Alfred Lessard, Lewiston; and secretary-treasurer, Leslie Lapham, Auburn, Me.

PENN STATE CONFERENCE ON INDUSTRIAL EDUCATION

The Seventh Annual Conference on Industrial Education was conducted by the department of industrial education of The Pennsylvania State University in State College, Pa., on Saturday, October 30. The theme of the Seventh Annual Conference was "New Laboratory Techniques and Effective Teaching Aids in Industrial Education."

(Continued on page 6A)

The seventh annual conference on industrial education at Pennsylvania University, State College, Pa.
— Dr. S. Lewis Land, head, department of industrial education

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ASSOCIATION NEWS

(Continued from page 4A)

INDUSTRIAL ARTS POLICY AND PLANNING COMMITTEE

The cabinet of the industrial arts policy and planning committee, of the American Vocational Association, convened for an official meeting at the AVA Washington headquarters, Friday and Saturday, February 4 and 5, 1955.

In general, the group concerned itself with the selection of appropriate program topics for the industrial-arts divisional meetings at the 1955 AVA Convention to be held in Atlantic City, N. J., December 5–9. The general chairman who will co-ordinate programming for the entire industrial-arts division is John Smith, New Jersey State Supervisor of Industrial Arts. Mr. Smith will be ably assisted by a number of prominent industrial-arts leaders in making his final arrangements.

Program topics planned for the Atlantic City Convention include the impact of TV in industrial arts; project selection and design; tomorrow's teachers; and the place of drafting and planning in the industrial-arts curriculum. Another feature of the program will be the ever popular series of demonstrations involving new materials and processes pertaining to the teaching of industrial arts. All of the sessions this year will be designed around outstanding questions and problems paramount to successful teaching, curriculum construction, and supervision.

Lowell A. Burkett, AVA Assistant Executive Secretary, was in attendance to explain recent legislation affecting the vocational education and general education. He was enthusiastic and optimistic about the future of the practical arts and vocational education programs in American schools.

In attendance at the meeting were Dr. Shriver L. Coover, AVA vice-president for Industrial Arts and chairman, head of Industrial Arts, State Teachers College, California, Pa.; Dr. G. Harold Silvius, vice-president of the Industrial-Arts Division, head of Industrial Education Department, Wayne University, Detroit, Mich.; Verne L. Pickens, secretary of the Industrial-Arts Division, chairman of Practical Arts and Vocational Education, Kansas City, Missouri Public Schools; William R. Mason, industrial-arts editor for *AV Journal*, supervisor of Industrial Arts, Cleveland, Ohio Public Schools; Dr. Ivan Hostetler, head of Industrial Arts, North Carolina State College, Raleigh, N. C.; Lowell A. Burkett, AVA assistant executive secretary, and Dr. Chris H. Groneman, head, Industrial Education, The Agricultural and Mechanical College of Texas, College Station, Tex.

NEW MEXICO INDUSTRIAL ARTS ASSOCIATION

The New Mexico Industrial Arts Association held its annual meeting at Albuquerque, October 28 and 29, 1954.

The officers elected for 1955 at that meeting, are: president, Dr. A. A. Bettina, Portales; vice-president, Chester R. Brown, Albuquerque; secretary-treasurer, William Forkner, Hobbs; board of directors, John Foster, Tucumcari; Elmer Kuhn, Albuquerque; Lawrence Frederick, Silver City.

♦ Officers elected for 1955 by the National Association of Industrial Teacher Education at the American Vocational Association convention in San Francisco, are: president, E. W. Tischendorf, Kent State University, Kent, Ohio; vice-president, Edward K. Hankin, Florida State University, Tallahassee, Fla.; vice-president, H. H. London, University of Missouri, Columbia, Mo.; trustee, M. Ray Karnes, University of Illinois, Urbana, Ill.

C. F. Highlen, Purdue University, was elected to a 3-year term on the Trade and Industrial Policy and Planning Committee.

♦ The officers elected for 1955 by the National Association of State Directors of Vocational Education at San Francisco on December 3, 1954, are: president, C. L. Greiber, Wisconsin; vice-president, Wesley P. Smith, California; secretary-treasurer, John P. Walsh, New Hampshire; executive committee, J. E. Hill, Illinois; Ralph Howard, Ohio; A. E. Robinson, Louisiana; representative to the AVA Advisory Council, Joseph C. Strobel, New York.

♦ The National Council of Local Administrators of Vocational Education and Practical Arts elected the following officers for 1955: president, L. E. Wass, director, industrial and adult education, Davenport, Iowa; vice-president, George Morgenroth, Newark, N. J.; vice-president, Rex Smelser, Lake Charles, La.; secretary, Robert Mellman, Easton, Pa.; treasurer, Warren K. Begeman, St. Louis, Mo.; executive committee, Hobart Sommers, Chicago, Ill.; J. E. Bowen, Bellingham, Wash.; Thomas Bell, Memphis, Tenn.; and Lee W. Ralston, Los Angeles County, Calif.

♦ The third annual convention of the Colorado Industrial Arts Association will be held on April 23, 1955, at Colorado A. & M. College, Ft. Collins, Colo.

♦ The West Virginia Industrial Arts Association will hold their spring meeting on April 15 and 16, at Jackson's Mill, W. Va. Mt. Vernon Hall will serve as headquarters for this meeting. — *Lawrence E. Hayes.*

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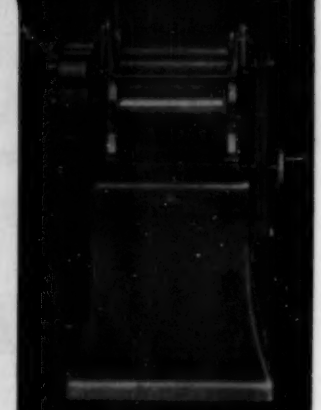

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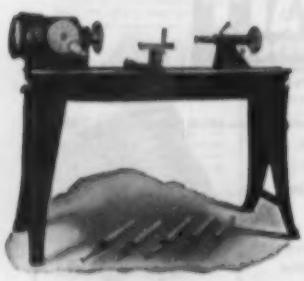

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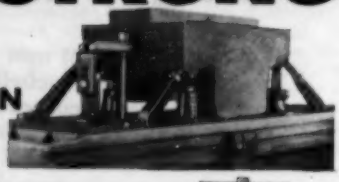

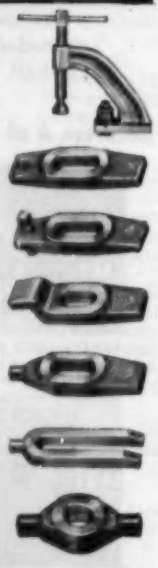

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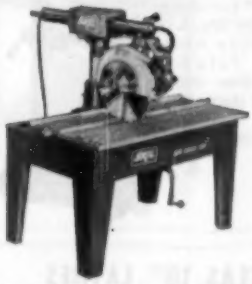

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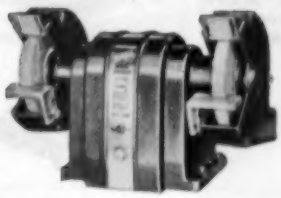

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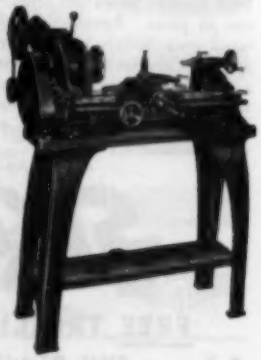

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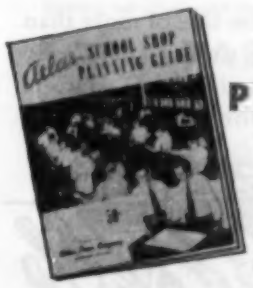

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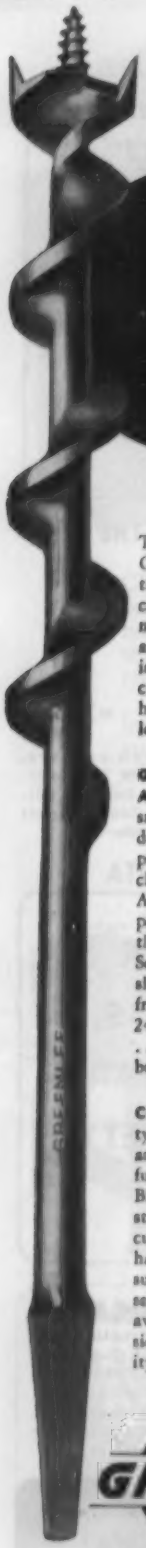

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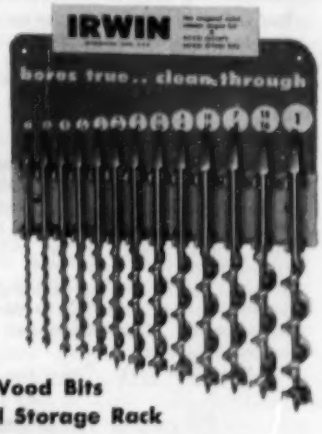

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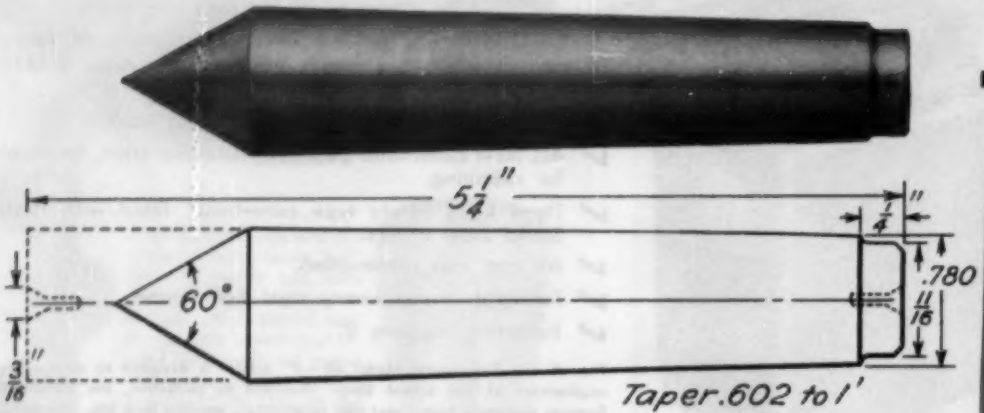
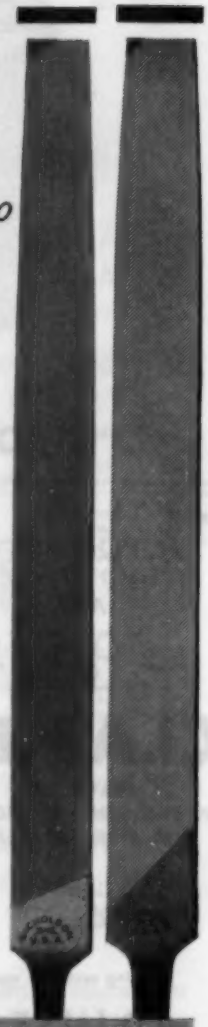
HOW-TO project for the School Shop

—by NICHOLSON FILE COMPANY

NO. 7 OF A SERIES

MAKING A LATHE CENTER with a Standard No. 3 Taper





Here is a precision exercise which affords the student excellent school-shop practice in lathe work. It illustrates, among other things, the fine work attainable with either of two commonly used Nicholson files: Mill Bastard or Long Angle Lathe.

Material: 1 piece 1⅛" x 5¼" CRS.

Tools: Combination drill and countersink, 6" rule, rt. side tool, rt.-hand round-nosed tool, 3" dividers, 4" outside calipers, 1" micrometer, 60° center gage, Standard No. 3 taper ring gage, piece of chalk, 10" Mill Bastard file or 10" Long Angle Lathe file.

SCHEDULE OF OPERATIONS

1. Center stock to 3/16" dia. center holes, using combination center drill and countersink.

2. Set spindle speed at approximately 200 RPM and rough-square one end with rt. side tool, hand feed. Finish-square same end, using spindle speed of 300 RPM, hand feed.

3. Offset tailstock approximately 9/64" toward operator, using 3" dividers to check reference lines on tailstock. **Caution:** loosen tailstock clamp before adjusting.

$$\frac{\text{Length of work}}{12} \times \frac{\text{Taper per foot}}{2} = \text{offset}$$

$$\frac{5\frac{1}{4}}{12} \times \frac{.602}{2} = .131, \text{ or } 9/64\text{" offset}$$

4. Set spindle speed at 200 RPM with .010 feed, using rt.-hand round-nosed tool. Take cuts leaving 13/16" dia., measured with caliper at small end of taper.

5. With spindle speed of approximately 300 RPM and feed of .007, make trial cut .008 deep and check taper with Standard No. 3 taper ring gage. Use chalk to check bearing surface. Check taper with instructor before taking finishing cut.

6. Take finishing cut, using same speed and feed as in step 5. Turn to .783, measured with 1" micrometer on extreme end of work.

7. Set lathe in alignment. With rt.-hand round-nosed tool turn small end to 11/16" dia. caliper measurement ¼" in from end.

8. Prepare for filing lathe center by rolling up sleeves so they will not catch in lathe dog, and by making sure no loose clothing can be caught in work. (To be on safe side, take off wrist watch, too.)

9. Set spindle speed at approximately 500 RPM, giving surface speed of about 130 FPM with work of approximately 1" dia. Disengage feed gears and oil dead center. Using either 10" Mill Bastard or 10" Long Angle Lathe, file work with long, even strokes to .780, measured at extreme end of taper. Hold file perpendicular to work and advance half its width with each stroke. Exert just enough pressure so file will cut and not hog into work. (Too much pressure will cause file to pit and leave a very rough surface. Too little pressure will dull file quickly.) Check taper with Standard No. 3 taper ring gage to ensure even bearing surface. Short, rapid strokes will make work out-of-round. Check work with instructor.

10. Remove face plate and knock out live center. Clean out mating surfaces before replacing work.

11. Set compound rest at 60° angle. Turn center point to 60° angle to fit center gage.

Either the Nicholson 10" Mill Bastard (left) or the Nicholson 10" Long Angle Lathe (right) will do a precise job on this project. They are among the most popular and most commonly used files in shop work. (Shown approximately half size.)

FREE REPRINTS OF THIS PAGE

for school-shop use will be sent to school heads or instructors on individual request. Ask for "How-to Project No. 7," giving minimum number of copies you need. The files recommended in the foregoing text are made in both Nicholson and Black Diamond brands, and are widely obtainable from industrial supply houses and hardware dealers.

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Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
APRIL 1955

A Troublesome Question —

Should College Credit Be Granted for Trade Experience?

A. A. VEZZANI
Assistant Professor of Vocational Education*
University of Michigan
Ann Arbor, Mich.

The idea of granting college credit to college students for trade or industrial experience[1] is not new. Records show that this practice has been in operation as far back as 1930. During that year a study was made at the University of Pittsburgh by A. T. Siedle,[2] which was later published in Federal Bulletin, Number 152. In this study, it was pointed out that one institution (Colorado A and M) had a definite plan for the evaluation of trade and industrial experience as a basis for granting college credit. It was also found that five institutions allowed credit for experiences which they felt were equivalent to the shop and drawing courses in their colleges, and eight institutions had some form of trade tests for evaluating trade experience in terms of college credit.

Other studies, one in 1947 at the Louisiana State University by E. G. Smith, and another in 1948 by Eugene Fink, University of the State of New York, indicate that there has been a gradual increase in the number of institutions adopting some form of evaluation procedures. More recently a study was made by the State Department of Vocational Education in Connecticut in which the results obtained support the data gathered for this article.

In a changing world it is to be expected that the standards created by social groups will change as conditions change. This has been particularly true in regard to the accepted standards for teacher certification. A review of the requirements for trade and industrial teachers in effect 20 years ago would reveal that those responsible for the appointment of individuals to teach a trade were willing to approve craftsmen who could provide evidence that they were competent mechanics. As time passed, the tendency grew to demand that these craftsmen secure a broader background of education before they came into the schools to teach.

In order to provide this broader background, and in an effort to develop the desired characteristics, programs of teacher education were prepared and offered for this group at our numerous teacher training institutions. Later academic courses were added to this vocational teacher preparation program until finally the general attitude among educators today is that the minimum academic standards for approval as a teacher shall be a bachelor's degree. *This in no way minimizes the fact that the individual must be a tradesman.* We merely point out that today he must be a tradesman and a teacher.

The trade a vocational teacher is expected to teach constitutes, in a large part, his subject matter. Since most teachers acquire a knowledge of their subject as a part of their degree program, it is felt by some, that experience in industry should be equivalent, in some degree, to college experiences in the same area of work. Thus, it becomes a natural request for individuals who have had experiences in the areas in which they propose to teach to request credit toward a degree for such experience.

Some colleges have recognized the inequity of this condition and have developed policies to correct it. Naturally, these policies vary in different colleges, but all of them together indicate quite clearly that the need for some method of evaluation is being recognized.

Individuals interested in receiving college credit for trade experience sometimes are placed in an embarrassing position since they are made to feel that they are asking for a special privilege

*At present Chief Technical Adviser, El Olivar School, Mexico City, Mexico.

[1]Industrial experiences such as teaching experience in industry, supervisory experience, administrative experience, experiences gained in training programs within industry, and technical or engineering experiences in industry.

[2]Siedle, Anthony Theodore, *Present Practices in Vocational Industrial Teacher Training Institutions of Granting College Credit for Trade Experience, For Teaching Experience in Trade Schools, and for Supervisory and Administrative Experience in Vocational Education.* Federal Board for Vocational Education, Bulletin No. 152, Trade and Industrial Series No. 43, Washington, D. C., 1930.

and that the trade experience is not up to college standards, regardless of what it may be. Yet, in some cases colleges refusing to grant credit expect the candidate to repeat the work in their college shops. Thus we have situations where one institution will, with reservations, encourage teachers to apply for such credit, while others, sometimes in the same state, will condemn the practice. Perhaps more people with practical experience would become interested in a college education if more uniform practices were established.

Industry is resorting to several techniques to secure men with both practical experience and a college education. Teacher education institutions operating programs wherein the students receive a background of practical experience plus college training report over 50 per cent of their graduates being attracted into industry rather than the teaching profession. One large corporation is now attemping to incorporate in their apprenticeship related instruction program, courses which not only meet the apprenticeship standards, but also will be acceptable for transfer to a college program should the apprentice decide to enter college on the completion of his apprenticeship. This organization is attempting to secure 32 hours of college credit for this course work.

Three methods now being used to develop graduates who have both practical experience and a college education are: through aprenticeship plus college training, through the granting of college credit for prior trade experience as described in this article, and through co-operative programs where college students get practical experience credit by working in a co-operating industrial establishment. The latter idea has been used for many years and should not be considered as a substitute for the idea discussed in this article.

It was for the purpose of determining the extent to which colleges are granting credit for *prior* trade experience that this study was undertaken. The findings indicate that much thought and work have gone into the development of plans which are *educationally sound* for the evaluation of trade experience. Space limitations do not permit the inclusion of the vast amount of material assembled and studied, nor the inclusion of the complete report in this article.[3]

The following summary and table shown in Figure 1, will give the reader an idea of the trend and the patterns which have been established by colleges in which some action has been taken. In conclusion it should be pointed out, however, that it is possible to abuse such a procedure and any such abuses make it difficult for those attempting to promote the idea.

[3]A copy of the complete report may be obtained by writing to A. A. Vezzani, 4002 University High School, University of Michigan, Ann Arbor, Mich.

Summary of Survey

1. To obtain the data included in this report, letters were mailed to 33 agencies. Of this number 28 (85%) responded.
2. Twenty-six states were represented in this survey, and of this number, 23 (88%) responded.
3. Of the 28 agencies which answered the questionnaire, 16 indicated that college credit was allowed for trade experience. This figure represents 57 per cent of those who responded.
4. Eleven of the 28 (39%) indicated a definite plan is in effect for the evaluation of trade experience in terms of college credit.
5. Examination of the plans used to evaluate trade experience for college credit, shows considerable variation in procedure and requirements.
6. The minimum number of years of trade experience required before the candidate is considered for credit varies from 1 to 4 years. Some colleges are willing to evaluate one year of experience whereas others will not consider evaluation of trade experience unless the candidate has served a minimum of four years in the trade.
7. The number of credits (semester hours, term hours, units, quarter hours, semester credits) allowed for trade experience varies from 16 to 40 (average 28).
8. Some institutions evaluate experience only in terms of similar experiences gained in campus course offerings. In such cases, the instructor who teaches the course examines the candidate and recommends the amount of credit. The examination may be the oral, written, or performance type, or any combination thereof. Some use only the written while others use only the performance.
9. In some cases, trade competency type examinations are used. These are usually administered by a committee either made up entirely of educators or a committee representing education, labor, and management. The credit in such cases may be granted as course credit or as a given number of units toward graduation.
10. In one state, California, a board of examiners is responsible for the evaluation of trade experiences. This board recommends to all state colleges the amount of credit to which the candidate is entitled. State colleges then may accept or reject this recommendation when the candidate applies for admittance to the college.
11. Some institutions evaluate *not only* trade experience but also general indus-

SUMMARY OF SURVEY

State	Name of Agency Surveyed	Credit Granted	Units of Undergraduate Credit Allowed for Trade Experience	To Qualify for Credit Candidate Must:	Experience Evaluated by		
					Trade Comp. Tests	Course Instructor	Evaluating Committee
California	Bureau of Ind. Education, 721 Capitol Ave., Sacramento	Yes	25 to 40	Have completed basic teacher training course	...	...	...
Colorado	Colorado A & M College Fort Collins	Yes	46.5 credits	Be enrolled in Col. of Educ. Employed as teacher	Yes	Yes	Yes
Connecticut	State Dept. of Education Hartford	Yes	None specified	Credit based on exam	...	...	...
Florida	Florida State University Tallahassee	Yes	30 semester hrs. maximum	Be enrolled in college and have had experience as voc. teacher	...	By examination	...
Georgia	State Dept. of Education Atlanta 3	No	...	...	...	...	...
Illinois	University of Illinois Urbana	Yes Indirectly	...	Take proficiency examinations given by instr.	...	For shop courses only	...
Indiana	Purdue University Lafayette	Yes	6 to 24 hrs.	Be employed in voc. program or enrolled for B.S. in Ind. educ.	Yes Page 10*	Yes Page 10*	Also used
Iowa	Iowa State College Ames	Yes Indirectly	...	Be enrolled in college of ed.	...	For shop courses only	...
Kansas	Kansas State Teachers College Pittsburg	Yes Indirectly	15 semester hrs. maximum	Be in-service teacher enrolled for B.S. in indus. educ.	Oral Written Perform.	...	Yes
Kentucky	University of Louisville	No	...	...	...	...	...
Michigan	Wayne University Detroit	Yes	24 semester hrs. See Introduction, Page 15*	Be in-service teacher enrolled in Ind. educ. curriculum	...	Yes	Yes, for course credit
	Western Michigan Col. of Education Kalamazoo	Yes	18 semester hrs. maximum	...	Perform. Written	Yes	Yes
	University of Michigan Ann Arbor	No	...	...	...	...	...

State	Name of Agency Surveyed	Credit Granted	Units of Undergraduate Credit Allowed for Trade Experience	To Qualify for Credit Candidate Must:	Experience Evaluated by		
					Trade Comp. Tests	Course Instructor	Evaluating Committee
Missouri	University of Missouri Columbia	No	...	...	...	...	...
Nebraska	State Board of Education Lincoln	No	...	...	...	...	...
New Jersey	Dept. of Education Trenton	Salary Schedule Only	...	See Page 21*	...	...	...
North Dakota	N. Dak. School of Science Wahpeton	...	...	...	...	...	...
Ohio	University of Cincinnati Cincinnati 21	Yes	20 semester hrs. maximum	Be enrolled for a degree with a Major in Voc. T & I Education	Yes	Yes	In Dept. Voc. Ed.
	Kent State Univ. Kent	Yes	36 quarter hrs. maximum	Be enrolled for degree in T & I Education	Perform. Written	Courses 301 and 302	Yes
Pennsylvania	University of Pennsylvania Philadelphia	Yes	24 semester credits, maximum	Have 6 yrs. experience in trade and enrolled in classes for tryout	...	Prove ability in shop for credit	...
	Pennsylvania State University State College	Discontinued 1936	...	...	...	...	...
South Carolina	A & M College of South Carolina Clemson	Yes Indirectly	12 semester hrs. maximum	Be enrolled in the college	Yes	Yes	...
South Dakota	Dept. of Public Instruction Pierre	No	...	...	...	...	...
Texas	University of Texas Austin	No	...	...	...	...	...
	Texas A & M College Station	Yes	20 semester hrs. maximum	Be interested in becoming teachers	...	Yes	...
Washington	State Board for Voc. Education Olympia	No	...	...	...	...	...
West Virginia	State Board for Voc. Education Charleston	No	...	...	...	...	...
Wisconsin	Stout Institute Menomonie	Yes	24 hrs. undergraduate credit only	Be enrolled in undergraduate curriculum	Oral Written Perform.	Yes	Also used

*Detailed Report.

Fig. 1. Summary of survey to determine policies followed in evaluating trade experience for college credit

trial experience, experiences of a supervisory or technical nature, and plant instructor experiences.

12. In most cases, the credit granted for trade experience is *undergraduate* credit to be applied toward a degree in trade and industrial education.
13. Institutions granting college credit for trade experiences obtained concurrent while working toward a degree, usually indicated by a course number are not considered in this report. Only trade experiences obtained prior to entering college are considered for credit.
14. Several colleges reporting such plans in operation complained of the lack of requests for the evaluation of trade experiences. Some indicated doubt whether the work involved in setting up a plan is justified in terms of the number being served.
15. Units earned for trade experience are credited to the individual after he has earned a given number of units on the campus. A given number of units of credit for trade experience being granted after the student has completed 30 units or one semester of work. This is continued each semester until the individual receives all of the credit earned for his trade experience.
16. In most cases credit obtained for trade experience is not transferable and does not meet the requirement of residence credits.
17. It was found that most colleges will not accept credit earned for trade experience at other institutions.

Educational television can do wonders in aiding the unfortunates who are confined to their homes, and it could be of great value in adult education. — *Dr. Baker, General Electric Company.*

A Modern Teacher's Aid —

Use of the Tape Recorder

GHERNOT L. KNOX
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The tape recorder does not and cannot take the place of the teacher. It has, however, a real place in teaching.

One of the writer's main objectives is to get the students and lessons out of the school and into the community. It is, of course, difficult to secure people of importance to come and talk to one class, let alone to spend a day talking to several classes. However, we have found that important people do have time and are willing to talk with student interviewers. These recordings can then be used as many times as the teacher wishes.

The uses of the tape recorder that follow are only parts of total lesson units which covered periods of from one to three weeks and were made up of many varied additional activities.

History unit on freedom of speech. As a part of our freedom of speech work, two senior students interviewed the editor of the local paper and a local lawyer regarding libel, slander, freedom of the press. These interviews were re-

corded and brought back for the class to hear. Many questions brought up previously by the students and the teacher were answered by hearing these recorded interviews.

History unit on labor unions and strikes. During a local strike, we studied labor unions and strikes. Besides on-the-spot reports from class reporters and interviews not recorded — with strikers and pickets and supervisory personnel, a team of student interviewers made an appointment and recorded an interview with the local and national union leaders.

Our plans called for an interview with the company superintendent but arrangements could not be made at that time.

Spelling. Our spelling lessons consist of spelling words in the form of sentences. These sentences are dictated to the classes on Monday, Wednesday, and Friday. If on Monday or Wednesday a student makes no more than two errors in spelling and punctuation, he does not have to do spelling for the rest of the week.

Some of the spelling lessons are recorded on tape for dictation to the class during the week. After the dictation part of the tape is made, a correction of these sentences is made by recording the correct spelling of the difficult words. Thus a student, when he has time, may use the recording machine to study his words by writing the sentences as a test and then correcting them with the same tape.

In this manner he learns by seeing the words on the duplicated lists of spelling sentences for that week, hearing the correct spelling and by practice in writing and checking the sentences.

Oral book reports. Nearly every month students may give oral book reports if they wish to do so.

The reports are told into the recorder and then played back for the student and the teacher to hear.

Personal property tax lessons in history and English classes. In our city, a drive was made to have people file personal property lists for tax purposes.

After a discussion in class of the why's and how's of personal property taxes, two student interviewers with the recorder, went to the city hall during the last day to file the property lists. At the city hall they interviewed the chief assessor, one of his clerks, the mayor, and about ten citizens in the lobby on their way to file the property list forms.

The recording was then brought back for use in classes.

Radio programs of interest and value to history and (or) English Classes. When some very special news event breaks, one or two 15 minute news commentaries are recorded during the evening for use the next day.

Sometimes a Sunday afternoon, half hour news of the week program is recorded and brought to class for study.

Radio plays of historical value are recorded and used in classes.

Testing with the tape recorder. During the use of two parts of the history film "Land of Liberty," a committee was assigned to edit original questions made up by the class and then make them into a test.

They made up multiple choice tests and put them on tape. The questions with the correct answers were given after the test part of the tape. After the test papers were collected, the rest of the tape questions and correct answers — was played.

Senior graduation speeches. The seniors giving speeches for graduation were rehearsed with the tape recorder. The speech would be recorded and then played back to the speaker and the instructor. Progress was amazing.

Glee Club Rehearsal. Use of the tape recorder created much interest, greatly increased the students' attention span and improved the singing in our glee club.

Panel discussions. Panel discussions were recorded and played back to the students involved in order that they might be made more aware of weaknesses in their discussion procedure and techniques.

Applying for a job in class interviews. A student from each trade represented in my Junior English classes was given instruction in interviewing people for a job related to his trade. During the unit on applying for a job, each student was interviewed by the student interviewer, application forms being used during the interview. The recorded interview was then played back to the prospective employee.

Applying for a job in out-of-class interview. A local automobile dealer agreed to interview an automobile repair student for a job. A student tape recorder operator went along and recorded the interview for the rest of the class to hear.

Checks. During the sophomore unit on order letters and checks, three students recorded their interview with a local bank president regarding checks and checking accounts.

Collecting bills. The recorder was used during our study of writing and explaining bills for trade related jobs. A customer — one of the students — would be presented with a bill. His talk with the shop owner concerning the amount, items, etc., on the bill would be recorded to play back to the two students concerned.

The school director and assistant director were also presented with bills and the discussions recorded for other classes to hear and discuss.

"Time" news film strips. A senior history class committee recorded their forum discussion of a news film strip. The film strip and the recorded commentary were then presented to several underclass groups.

Earphone listening. A table wired for earphones for small group listening. The recorder speaker is not used during much of the class time, but small groups work on spelling study, listening to their own recorded oral expression work such as technical explanations, forum discussions, and extra radio listening.

Conclusion. Do your students come to you with ideas for new and different projects? They should. Many of these tape recorder ideas were suggested all or in part by the students.

It is not reasonable to believe that a teacher can sit down, and plan in one day all the uses of a tape recorder for a school year. This is something that must be developed as it is used. The suggestions given in this article are really only suggestions for several starting places for the development of this type of work.

More than 2.8 billion net tons of iron ore has passed through the Soo Canal in the 100 years since the first lock was opened in June, 1855. Piled in one place, that ore would form a cone-shaped mountain with a base of 3.6 million square feet and as high as California's 14,945-foot Mount Whitney, tallest in the United States. From it could be made close to 1.5 billion tons of pig iron. — *Steel Facts.*

The Missouri Pacific soon will be completely dieselized, with 873 diesel locomotives instead of the 104 with which they began their diesel program in 1947. — *Petroleum Newsnotes.*

Coat of arms plaque submitted by Sam F. Hall, High School, Clayton, Mo.

Placing Art Where it Belongs—

The Art in Industrial Arts

GERALD BAYSINGER
Wayne University
Detroit, Mich.

"Beauty may be only skin deep," observed a forgotten author, "but the skin is all on top, and shows so blamed plain." So, too, are the projects which our students make; as a result, we tend to be oversensitive to what we call *standards*. If a student's project is not up to this *standard*, we are reluctant to let him take it out of the shop. Criticism from fellow teachers or parents is thought to reflect upon our ability as teachers. This tends to reduce the amount of experimenting, encourages the use of traditional projects and designs, and discourages any inclination to permit the student to design a project or to participate in designing one. As a result, we are constantly on the lookout for projects which students will like; half or more of the space in our professional magazine is devoted to new projects. We consider many of our problems solved if we have accumulated four or five "crack jobs" over a period of years.

Even so, are the projects which students make good in design? Many city supervisors do not think so; teachers, generally, express a need for formal training in art; and teacher educators seem to agree that a course in "design" should be included in the curriculum.

But attempting to solve an educational problem by adding another course is rarely productive. Besides, design is not additive in the same way that an ingredient such as flavor or color might be blended into a bowl of cake batter. Neither does design consist of a set of principles or recipes; nor can the problem be solved by using project kits, which are similar in some respect to prepared cake mixes. In other words, the problem of improving projects which students make does not have a solution which is simple, or which does not require change in our notions about design and in the ways we teach.

Let's take design first. Is it surface decoration, color, form, texture, function; is it one or a combination? Is design good or bad in itself or in terms of surroundings and environment; is good design measurable in terms of popular acceptance, or is a good design always good? Are there rules in the game of design which characterize all good design; if so, have these always been true, and will they always be true? If design is structured by eternal truths and fixed principles, what evidence is there to suggest that other details of man's existence are not also governed by similar rules of behavior? Does such a belief cast us in roles similar to those played by the ants and other social insects in whom Nature has assigned prescribed behavior by biological mechanisms? If you reject that idea, then you will likewise reject the notion that man's destiny is predetermined, and find more palatable the belief that man determines his own ends, writes his own history, and judges design as good or bad according to his own likes and dislikes which he learns.

To say that we learn our notions about the *goodness* of design is illustrated by the fact that black was a preferred color for automobiles as late as 1947 and that our concept of automobile as *black* is traceable to early advertisements which appeared in newspapers and magazines in black and white rather than color. Today, various shades of blue, green, red, gray, maroon, yellow, orange, and lavender in combination make a spectrum out of any road on a sunny afternoon.

Learned also are notions of balance, symmetry, and so on, from the houses we live in, the clothes we wear, the dishes we eat from, and the trees, flow-

Students of Stratford High School, Stratford, Conn., who won $480.00 including an outstanding achievement award in the 1953–54 Ford Industrial Arts Award Contest. — *Top row, left to right:* Donald Fowler, Principal; Herbert Yankee, instructor in mechanical drafting; Earl Flagg, instructor in graphic arts (winner of Outstanding Award Trip to Detroit); Conrad Meyer, instructor in machine shop; and Charles Quinlan, director of industrial education. — *Middle row, left to right:* Eugene Schwetz, Matthew Jankowski, Raymond Hyslop, Joseph Mosier, Daniel Andreites, and Walter Noblin, Jr. — *Front row, left to right:* James J. Ritchie, Paul Stragio, William Knecht (Outstanding Achievement Award), Earl Cornelius, Jr., Paul Flagg, and John McQuillan. — Absent when picture was taken: Marion McCoach, Carol Wilson, David Hubbell, and Paul Hennessey. — Photograph and information submitted by Charles Quinlan, Jr., director of industrial education.

ers, and shrubs which are a part of our environment. Because most of us are unaware of these learned notions, we tend to perpetuate them without realizing it; the artist's job is to stimulate us to take a new look at ourselves and our environment.

He rejects the pictorial representation which is what most of us see when we look at a portrait or a landscape; he tries to show us as we are to people other than our mothers; he suggests new forms, new arrangements, new combinations of colors. Using various materials, he creates notions and ideas which are not now in our immediate environment with the hope that they will find their way into the details of our daily lives as houses, chairs, churches, automobiles, factories, cities, and as improvements in our relationship with ourselves and with others.

We don't use all of the notions and ideas thus provided by the artist; sometimes pictures hang in museums for years before we discover them; sometimes ideas are too obscure, too far away from reality, too abstract. But when we discover them, or rediscover them, a whole new "movement" is born. Currently, we are in such a movement which is appropriately named *contemporary* and characterized by clean lines, simplified construction, lack of surface decoration, and use of color.

Interesting as this might be, how does it help us design a better project for students to make?

First, we need to get rid of any notions we may have had about principles of design which are, in effect, a way of copying. Whether we use an existing design outright, or translate it into principles which we then apply, it is still copying. Now there is nothing wrong with copying if that is what we set out to do; there is a legitimate purpose served by reproducing an object from a historical period. But if we have no intention to copy, then we had best reject *principles*.

Second, we need to begin, not with the project, but with the purpose which the project is intended to serve. As long as we think of *tie rack* which is, in effect, one solution to the problem of where to hang neckties, we are not going to make much headway. If, instead, we begin with the problem of what we can make or do so that our neckties, if any, have a place other than a doorknob or a bracket on the mirror, and reject the solution of *tie rack* with which we are already familiar, we have made the first step. Design begins with a problem, not with the project itself; this is true whether the problem is where to hang neckties or how to center punch metal for drilling holes.

Third, we need to conceive several possible solutions or *hypotheses of materials* which can be examined and tested. But since the possibilities which may occur to us are not only restricted by preconceived notions, but limited as well, we should invite others particularly those without preconceived notions to suggest ideas. The *others* who are most convenient for us, are the students in the class.

Not only will they suggest additional ideas but they will help us test proposed solutions. Will the new tie gadget hold enough ties; will it hold bow ties as well as cravats; will each tie be visible; will hanging up and removing a tie be easy to do? Where will the tie gadget be placed; how will it be attached, and to what? Will it look right in the room? What materials could be substituted for those proposed; are the materials used honestly? Is it economical to make; can students make it; do they want to make it?

Accepting the first idea that occurs to us doesn't necessarily result in a good design; for the first passage after the introductory theme, Beethoven wrote 14 different compositions from which he selected what he considered the most logical. Thackeray complained of spending two weeks on a single paragraph. If the great masters found it necessary to make more than one attempt, who are we to expect that our first idea will blossom out into a first-rate design?

Fourth, after we have examined and tested our many hypotheses, and selected one or more, we need to try it out. If the *project* is large, we can make a scale model; if the amount of material needed, or the time required are not excessive, students can be enlisted to do the experimental work. In either case, we will have something which can be further tested and, from our experience and that of our students, ways of improving the design, the construction, and the procedure will occur to us. After several such experiences, a student may carry through the designing of a project himself.

Interestingly enough, this is not only a procedure for producing a good design, but it is also good education. The steps through which we have led our students become to them a generalized procedure for solving other design, construction, and procedural problems which occur outside of the controlled conditions of the school shop. Such learning is the most practical of all, and contributes directly to the objectives of industrial arts and of education.

Mr. Lowell Jett of the Tucson, Ariz., Adult Evening School showing a student how to put the finishing touches on a leather case which he has just completed

Photo by Buddy Vaughn, advanced photography student. Submitted by Harry A. Goldstein, instructor of photography

Getting the Most Out of Exhibits —

Competitive Industrial Arts Exhibits*

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A group of teachers, officially known as the Willamette Valley Industrial Arts Association, have set out to prove the value of competitive project exhibits.

Selfish motives of commercial sponsors, undue burdens on students and faculties, and the questionable amount of educational value are among the more justifiable objections to competitive exhibits. However, this group of teachers believe that they are making fast headway in working out an annual contest that overcomes the more common objections of such events. Within two years, they have built up a strong local interest in industrial arts and have sent a fair number of projects to Dearborn, Mich.

This annual three-day event, still in experimental stages, is aimed at accomplishing these things:

1. To stimulate further interest in industrial arts among the students.
2. To stimulate further interest in industrial arts in participating communities.

A brief description of the Willamette Valley contest follows.

Planning the Contest

Paper work should be held to an absolute minimum. Otherwise, the operational machinery may soon outweigh the purpose of the exhibit. Nevertheless, some is essential.

Take, for example, the questionnaire which is sent to all shop teachers in the association. Instructors are asked to estimate the number of projects they expect to submit according to grade level and category — such as woodwork, grades 7 and 8; metalwork, grades 11 and 12, etc. The questionnaire is designed so tallies can be quickly and easily made after it returns.

"Simple forms minimize lengthy paper work and speed up the whole process," says Doe Green, secretary of the organization.

Registration is simplified with special dittoed forms and duplicate numbered tickets. One half of the duplicate ticket, Figure 1 is attached to the project, the other is given to the instructor as a claim check. The ticket and group numbers, the school, and the name of the project are written on a registration form.

PROJECT	PROJECT
No. 401	No. 401

Fig. 1. Duplicate tickets are used to simplify registration and organization. One-half is attached to the project; the other is given to the instructor as a claim check

Obtaining Prizes

Aware of the common inherent dangers from awarding prizes, the committee moved slowly and cautiously in this direction. To a large degree, the group has followed a policy formulated by a former president, George Perry, during the pre-exhibition planning period for the group's first contest:[1]

Our problem is not merely obtaining prizes. Our problem is to obtain prizes that have educational significance. All prizes should consist of items that will stimulate and inspire further interest in industrial arts, such as tools, materials, and equipment for home workshops — not free tickets to the local cinemas or free sodas at the corner drugstores.

Merchants are informed about the desire for specific types of prizes that have special educational significance. Some businesses, such as theaters, drugstores, and others who do not handle merchandise appropriate for the occasion, actually go out of their way and purchase suitable prizes.

National manufacturers, in general, are interested in supplying items for prizes.

No grand prize is given. In fact, even "medium" size prizes are discouraged. For example, one large concern offered

This prize is awarded to:

Name

School

through the courtesy of:

Business Firm Name

Address

Business Firm Name

Address

Thank you for this prize!
It was earned by:

Student School City

at the Willamette Valley Industrial Arts Awards Contest held in Salem, Oregon. May 21, 22, 23, 1953.

Fig. 2. This "two-piece" form card is used in conjunction with the prizes. The name, and school, of the student winning the prize is placed in the top half along with the name and address of the business firm that made the donation. The bottom half is torn off, the winner's name and school are listed, and the card is sent to the donor

*Photos by Arthur C. Corbett, industrial-arts teacher, Stayton High School, Stayton, Ore.

[1]"Clearing House," Mar. 1953, p. 432.

First-place winner in Group II, Grades 9 and 10, Woodwork Division

— Photograph by Arthur C. Corbett

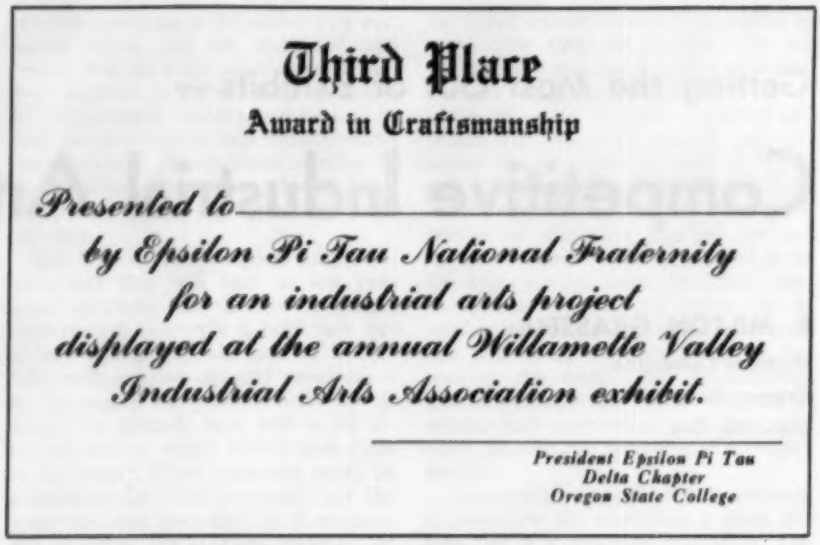


Fig. 3. Award certificates, for first, second, and third place, and honorable mention, were contributed by the Delta Chapter, Epsilon Pi Tau, Oregon State College

a $50 mechanical drawing set. The prize committee did not accept it. Instead, they suggested that 10 prizes with a maximum retail value of $5 would come closer to the general objectives of the contest phase of the exhibition.

"But all local merchants are not eager to give away merchandise," said one teacher. "A form card, when explained to the merchant, partially alleviated this problem." This form card, Figure 2, is attached to each prize. Space is provided in the top half to give the student's name, and school, who received the prize and the name and address of the business firm that made the donation. The bottom half is torn off, the winner's name and school are listed, and the card is sent to the donor.

Feeling that material prizes are not entirely satisfactory, Oregon State's Delta Chapter of Epsilon Pi Tau made a slightly different contribution; they provided certificate awards, Figure 3. These 5 by 8-in. certificates with a professional appearance were printed on different colored paper such as *First Place* (blue); *Second Place* (red); *Third Place* (white); and Honorable Mention (green). Old English lettering was used to denote *First, Second,* etc., places.

Exhibiting the Projects

The exhibits are rotated among the different towns in the Willamette Valley. The first was held in Albany and the second in Salem, the capital city. During the early part of the new school year, a location will be selected for next spring's exhibit.

These exhibitions are not held on the school grounds because the school is seldom the best place. They should be held where people will see them. Downtown show windows are excellent.

The Ford dealer in Salem (Valley Motors) felt honored in being able to offer their showroom.

Judging the Contest

Professors E. D. Meyer and Bruce Hahn from Oregon State were among the principal judges for the "Salem" contest. Both have judged the national exhibits at Dearborn, Mich.

The professors were assisted by Epsilon Pi Tau members from Oregon State. These students included Harvey Abrahamson, Raymond Fagan, Orland Killin, Malcolm Reynolds, Ray Soderquist, Garvin Jabush, Dave Turnbull, and E. Milton Grassell. Several Portland teachers helped, also.

To facilitate judging, all projects were placed in ten divisions. These are listed in Figure 4.

Each of the ten divisions was further subdivided into three specific groups: Group I included grades 7 and 8; Group II, grades 9 and 10; and Group III, grades 11 and 12. This eliminates eighth graders from twelfth-grade competition, etc. Also, this method parallels the clas-

DIVISIONS AND GROUPS

DIVISION	Group I Grades 7 & 8	Group II Grades 9 & 10	Group III Grades 11 & 12
Metal Working			
Woodworking			
Ceramics			
Electricity			
Printing			
Leather Work			
Mechanical Drawing			
Silk Screen Printing			
Photography			
Open Division			

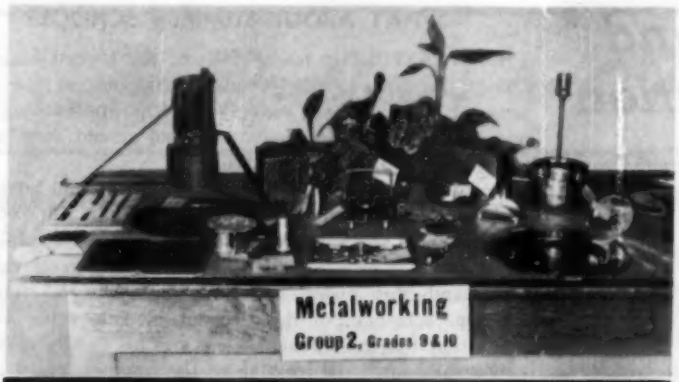
Fig. 4. All projects were placed within these divisions

A Blotter for Your Billfold

I obtained this at the Willamette Valley Industrial Arts Project Contest

Salem, Ore. May 21, 22, 23 1953

Fig. 5. Billfold size blotters (3½ by 2¼ in.) were given to all visitors



Professor Hahn, H. Abrahamson, and D. Turnbull (left to right) from Oregon State College judging the Metalwork Division at Willamette Valley Industrial Arts Association

— Photographs by Arthur C. Corbett

sification used by the National Industrial Arts Awards Contest except that there is no provision for Group IV, Trades and Technical Entries.

Public Relations

Many who would never get to a school exhibit can't resist the temptation to view the excellent projects displayed in a downtown store window. Thus, greater opportunity exists to contact community members. Teachers and graduate students acting as guides take advantage of these situations by encouraging visitors to become more interested in their schools.

To further promote favorable public relations, two blotters are passed out with informative material printed on one side. One, Figure 5, a billfold size blotter, is a reminder; it says, "I obtained this at the Willamette Valley Industrial Arts Project Contest." The other, Figure 6 contains a brief message concerning the importance of industrial arts and general education.

Conclusions

Several basic criteria which help to assure a successful competitive exhibit follow:[2]

1. Exhibits should have ample educational value.
2. Adequate planning is essential.
3. The time and energy demands upon the faculties and students should not outweigh the purposes of the exhibit nor upset the school program. Undue burdens upon the staff and students do not contribute to a successful exhibit.
4. Prizes should be accepted only from merchants who are in worthy and generally accepted enterprises.
5. Prizes should consist of items that have educational significance — not free passes to the movies, cash, etc.
6. The contest should attempt to develop hobby or vocational interests and bring out latent talents.
7. Extreme tact should be exercised in awarding prizes.
8. Competent judges should be chosen.

General evidence indicates numerous advantages have been derived from these two annual contests. Specifically, they have stimulated students to take a renewed interest in their work and community members are beginning to realize the potentials of industrial arts as it fits into the pattern of general education.

[2] *Ibid.*

A Form of General Education

Industrial Arts — is one of the practical Arts and is defined as a form of general or non-vocational education which offers through various shops subjects opportunities to provide learners with experience, understandings, and appreciations of the tools, materials, technical processes and products of industry; and in which related information is presented on conditions within industry for occupational opportunities, social responsibility, and consumer appreciations, all as a definite part of the general education program.

Compliments of Salem High Graphic Arts Shop

Fig. 6. A brief message about industrial arts printed on a 6 by 3½-in. blotter

TANK CAR HISTORY

The first railroad tank car to be constructed specifically for commercial operation was loaded in 1865 at Titusville, Pa., where the first commercially successful oil well was drilled by Edwin L. Drake. Early oil cars carried only about 2000 gallons. Today's tank cars can carry more than six times as much. — *Petroleum Newsnotes.*

Potato storage can be prolonged by exposure to nuclear radiation, Brookhaven National laboratory biologists report. In the experiments, groups of potatoes were exposed to different degrees of radiation for varying times. Upon examination 18 months later, potatoes that had been exposed to medium doses of gamma rays showed neither sprouting nor softness. — *Industrial Research Newsletter.*

The United States has capacity to produce a record 125.8 million tons of steel in 1955. That exceeds the previous high capacity of 1954 by nearly 1.5 million tons. — *Steel Facts.*

Industrial Arts and Vocational Education

JOHN J. METZ, Editor

THE AIAA CONVENTION IN ATLANTIC CITY

THE BEACH in Atlantic City probably is the best known attraction to most summer vacationers, but that is not the only attraction that will lure industrial-arts teachers, their supervisors, teacher educators, and others interested in industrial-arts education to that city for the American Industrial Arts Association seventeenth annual convention held there on April 27, 28, and 29, 1955.

Hotel Chalfonte-Hadden Hall has been selected as the headquarters.

The convention will be first class as is attested to by the appointment of most excellent convention committee chairmen. Carl E. Frankson, head, department of industrial arts at the New Jersey State Teachers College in Newark, and John J. Smith, state supervisor of industrial arts, State Capitol Building, Trenton, N. J., are the cochairmen for the local arrangements for the 1955 American Industrial Arts Association convention.

The general theme of the convention is "Art and Industry: Their Significance for Industrial Arts Education." The topic for the first session on Wednesday, April 27, is "Industrialism: What It Is and What It Does." There will be two speakers to discuss the topic. Then the audience will be divided into five discussion groups, each with its own chairman, recorder, and discussion leader.

Wednesday evening such professional problems as recruiting candidates for the teacher education programs, accrediting teacher education programs, etc., will be presented.

Thursday morning methods of "Increasing the Use of Creative Intelligence in Industrial Arts Education" will be discussed, after which discussion groups will study the separate topics presented by the two speakers at the general session.

Thursday afternoon, two speakers will present the general topic, "The Place of Craftsmanship in Industrial Arts Education." The addresses of the speakers will be on "Developing a Sense of Craftsmanship in a Mechanized World," and "The Museum Aids in the School." Discussion groups will be formed as was done at the previous sessions.

On Thursday evening the three topics, "Increasing the Supply of Teachers," the "Problems of the Beginning Teacher," and the "Problem of Educating the Layman as to the Meaning of Industrial Arts," will be presented.

At the Friday morning discussion the topic is "Maintaining Balance in a Machine Age." The speakers will present talks on manual arts therapy in the rehabilitation of disabled veterans, leisure-time activities, and an evaluation of the now popular do-it-yourself movement.

Friday afternoon there will be two programs, one a student program conducted by students from teacher education institutions, and the other will be the business meeting.

The American Council of Industrial Arts Teacher Education, and the American Council of Industrial Arts Supervisors, affiliates of the American Industrial Arts Association, will also hold their meetings on April 26 and 27.

Friday evening has been set aside for the annual dinner and the "Ship's" program.

WHAT ABOUT SUMMER SCHOOL?

THE WEATHER in many parts of the United States still carries the nip of winter, yet the midpoint of the second semester of the school year 1954–55 is approaching. Anyone planning to go to summer school should start making preparations for the days ahead.

For this reason it is advisable to study the advertising pages of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION to find out what the various schools offer for the coming vacation season. These announcements appear in the March, April, and May issues. Then, too, it is wise to study how the time schedules of these schools fit into other vacation plans that the individual teacher and his family may have.

Not only must the location of the summer school be considered, but one must also ascertain at an early date whether the allowable student capacity of a given educational institution has not already been exceeded. It may be necessary to enter into correspondence with a number of schools; hence, it is well not to wait too long.

Make your plans early and have everything arranged before your vacation starts. A list of the summer school announcements that appeared in the March and April, 1955, issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION follows:

Bradley University, Peoria, Ill.

Colorado A. & M. College, Fort Collins, Colo.

Milwaukee School of Engineering, 1025 North Milwaukee St., Milwaukee, Wis.

New York University School of Education, Washington Square, New York 3, N. Y.

Oregon State College, Department C, Corvallis, Ore.

Oswego State Teachers College, Oswego, N. Y.

Pennsylvania State University, Department of Industrial Education, State College, Pa.

University of Minnesota, Minneapolis 14, Minn.

Wayne University, 5442 Second, Detroit 2, Mich.

A letter addressed to the Director of Summer Session of any of these teacher education institutions, will bring you complete information and a bulletin of the school chosen.

ACCIDENT PREVENTION

IN THE December, 1954, Los Angeles City School Shop News there is a short article in the "Safety Notes" column which contains some very fine pointers for the students in any school shop.

This article shows how the lack of courtesy is the cause of many accidents. Of course, many accidents are caused by thoughtlessness rather than by discourtesy, but students should be continually reminded that their own acts affect the welfare of others.

When safety rules are followed for one's own well-being, fellow workers must also be considered. Accident prevention presupposes that it is not just for the safety of one individual but also for the protection of that individual's fellow workers.

When looking for something which would help improve school shop safety, it is well to study the advances which have been made in industrial plants. Thus, the National Safety Council granted first, second, and third prizes for safe operations to nine plants and divisions of steel companies in five states in three major divisions of the metals section contest.

Let's copy industry.

Problems and Projects

DRAFTING TABLE AND STORAGE CABINET

HERBERT W. YANKEE
High School
Stratford, Conn.

This useful piece of shop equipment has been designed for use in our planning center in the woodworking department here at Stratford High School, Stratford, Conn. It has the following advantages:

1. It is a separate and contained unit. This means that it can be moved about as changes affecting shop layout are made.

2. It contains book and reference material storage compartments. The upper shelves are glassed in to facilitate selection of materials.

3. It has storage compartments for three to six 18 by 24-in. drawing boards.

4. There is a large drawer which is useful for storing paper and large shop prints.

5. There is a sloping surface provided for the drawing board with a retaining piece set in to prevent the board from sliding.

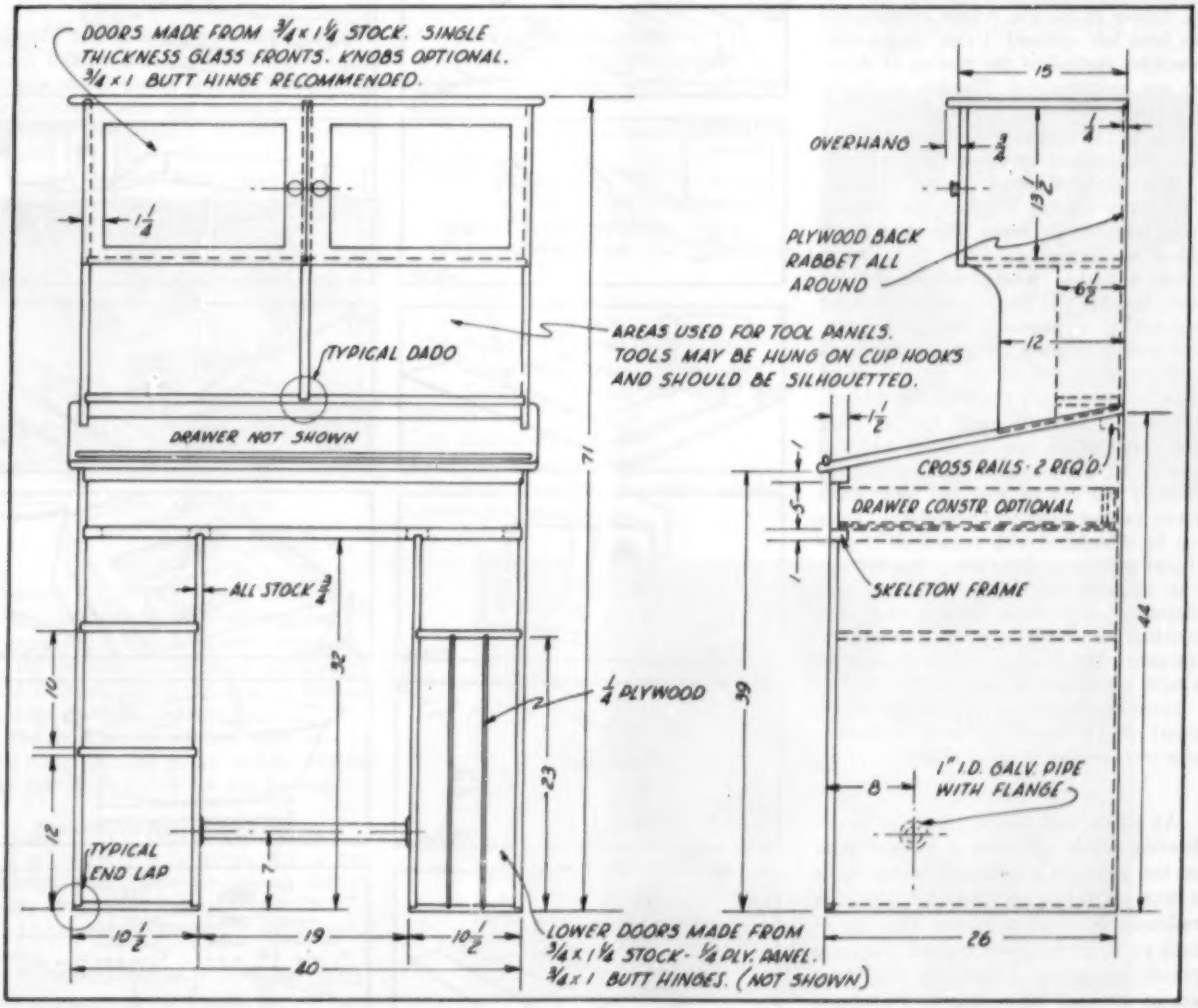
6. The base is solid in order that chips and shavings cannot collect underneath.

7. Adequate leg room is provided to allow for ease in use.

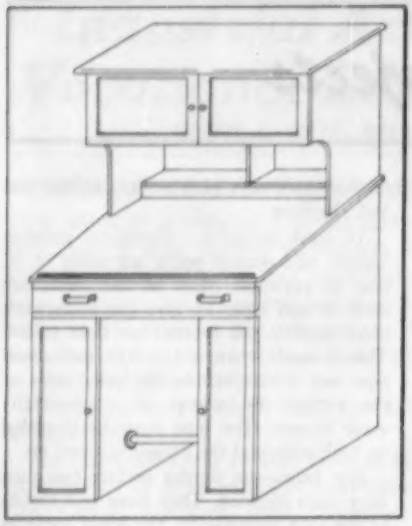
8. A built-in tool panel has been designed to accommodate placing the required drafting tools in a position to facilitate use and checking.

All stock except for partitions, skeleton frames, and drawer parts, are made of ¾ pine or plywood. Most of the joints are dado or end laps. To give the framework more rigidity, the footrail has been added. This is made from a 1¼ I.D. galvanized pipe and is attached to the inner sides of the cabinet by means of commercially made flanges. The pipe must be threaded on both ends and the flanges screwed on.

Just below the sloping surface two rails have been inserted. They have end tenons fitting into mortises on the inner surfaces of the sides. The drawer is supported by a skeleton frame of 1-in. stock. This frame adds rigidity to the cabinet and serves as



Details of the drafting table and storage cabinet



Drafting table and storage cabinet
by Herbert W. Yankee

a means of providing a surface upon which the drawer slides. The drawer construction has been left optional. Usual construction principles applied to the making of drawers are recommended. Handles or knobs used on the drawer are also optional.

Due to the possibility of breakage, the doors on the base have been designed with a ¼-in. plywood panel instead of glass. The upper cabinet employs the use of glass, standard thickness. The glass is retained by means of ¼ by ¼-in. strips nailed into the rabbet provided for the glass. Handles and knobs for the doors are optional. It is suggested that ¾ by 2-in. butt hinges be used for all cabinet doors with the gains cut on the inner faces of the doors and front edges of the cabinet.

The two recessed areas in the front above the slope are intended for tool panels. All the common drafting tools in ordinary use can be mounted here. Small hooks can be used for toolholders. Tools can be silhouetted with commercially purchased .020 in. thick, bright yellow acetate. This material can be effectively cut with shears to any shape desired and then mounted in the appropriate position on the panel. The T square can be hung from a hook placed on the side of the cabinet.

Finish treatment of the cabinet is optional since it should be treated to harmonize with prevailing shop colors.

An oil-derived plastic pipe now is delivering crude oil from a storage tank on the Fort Peck Indian Reservation to a tank car siding on the Great Northern railroad in Poplar, Mont. The three-inch pipe, made of oil-derived Butyrate plastic, comprises a nine-mile line, longest of its kind on record. — *Petroleum Newsnotes.*

POLYESTER PLASTICS IN A NEW ROLE

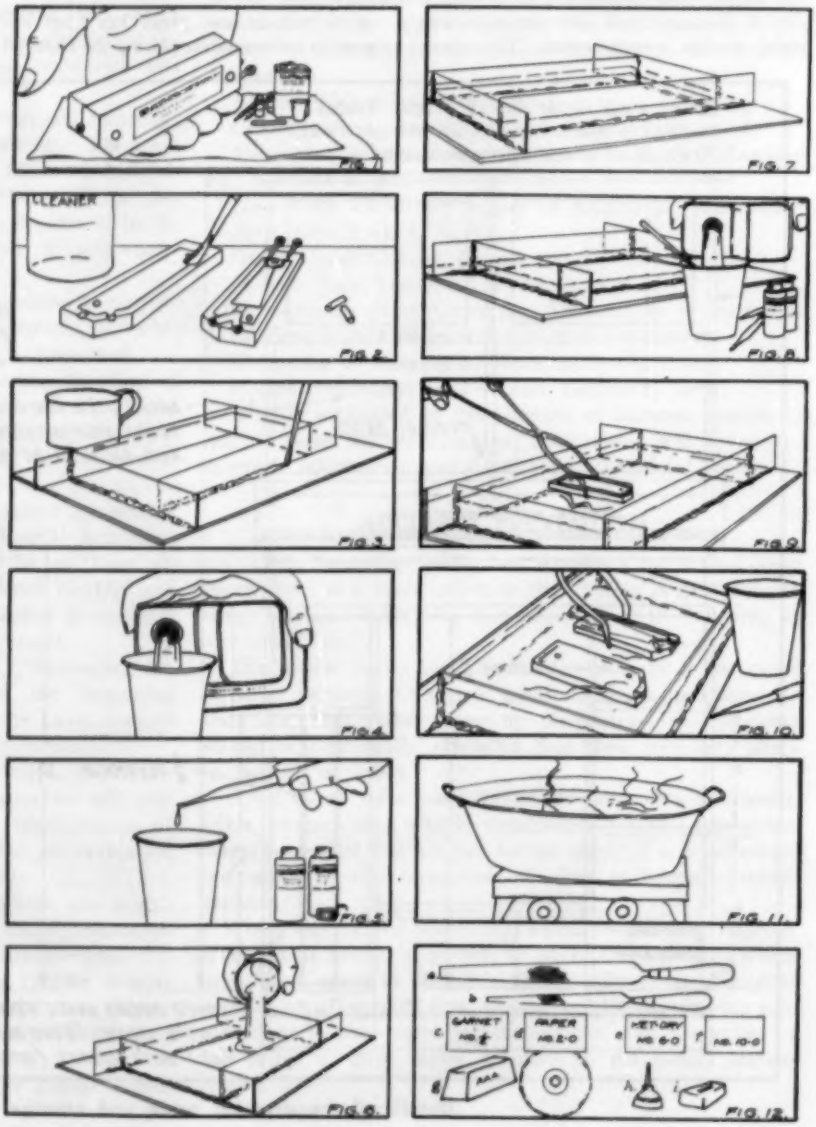
ALEXANDER F. BICK
Teacher in Milwaukee Schools
The Milwaukee-Downer College
The Stout Institute, Summer Session
Milwaukee, Wis.

Visual Education With a Fresh Approach

To show students the inside of a closed assembly, teachers have made drawings, or they went to great lengths picturing the hidden parts in film or film strip, and yet they have not given the pupil the concrete understanding he might easily gain, were he able to see the inside in reality. Take a radio tube for example. All its essential parts are ordinarily hidden, but in this project, its plate, heater element, grid, leads, etc., are held blown out and suspended within a solid block of crystal clear polyester plastic. Showing this tube to the class, there is no danger of losing or mishandling the parts. The student turns the block to look at the tube from all sides, and he easily picks out its working elements. It is a dramatic learning moment for him and he will always remember it. The block gives him a clear, orderly picture of the important factors by themselves, without titles, art, or motion. Nor is the finished visual aid fragile, dusty, or unsavory as a box or a card of samples often is. The block with its embedment is ever fresh and challenging.

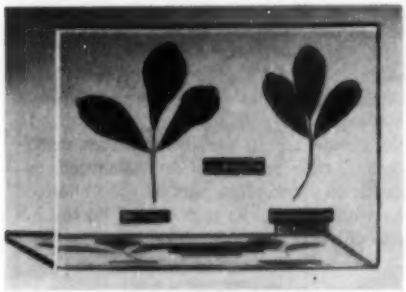
The polyester visual aid blocks are classified and filed like books as permanent, clear, and unmistakable answers to many troublesome questions.

The teacher can embed pertinent material



An interested student

himself, and he will find considerable personal interest and satisfaction in doing it. Every school would profit in many of its departments were key exhibits of fragile materials permanently set into polyester plastic.



Alfalfa specimens
— Photograph, courtesy of Science, Inc., Madison, Wis.

Many Uses

The illustrations show examples of industrial and college level applications used in the examination of small mechanisms, such as gears, and in the study of biology, zoology, agronomy, and botany.

The shop teacher will find many uses for this easily handled plastic and he will enjoy the simplicity of its use in class.

Projects in Polyester Casting

The following is a partial list of embedment possibilities for various departments of the school shop:

1. Assembly sequence for small instruments.
2. Transmission units for study: miniature gears, sprockets, worms, etc.
3. Lathe tool grinding, wrong and right.
4. Thread cutting method.
5. Comparative metal fastenings.
6. Drill grinding, wrong and right. Effect of high speed.
7. Examples of steel tests: Brinnell, impact, tension, etc.
8. Steel failure.
9. Ores — native and imported.
10. Blast furnace loading.
11. Ferroalloys used in open-hearth steels.
12. Weld examples.
13. Brazing examples.
14. Fossil copal resins in varnishes.
15. Wood fastenings, types and sizes.
16. Soldering, the wrong and right methods.
17. Carburetor assembly.
18. Distributor assembly.
19. Rotor winding. Armature winding. Commutator assembly.
20. High watt light element structure.
21. Radio tube structure. Comparative tube structure.
22. Condenser structure.

All of these and many more might be shown to students with telling effect. There is no clarity so clear as reality, and there is no teaching so basic. The transparencies add dignity and emphasis to the embedded part.

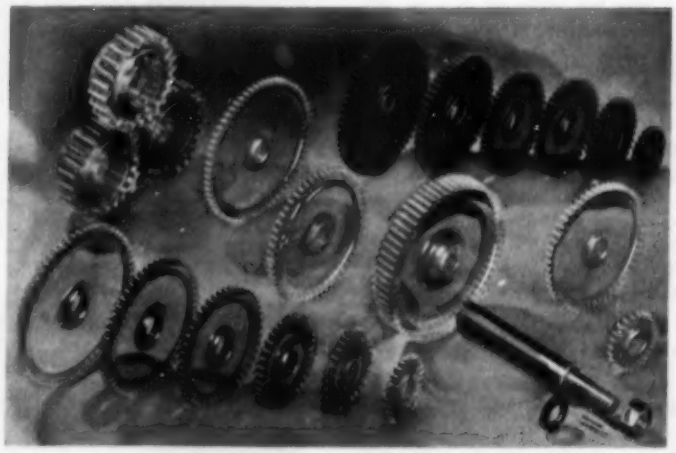
The Teacher Makes His Own Castings

The following presents the procedure, step-by-step, of how the teacher may make teaching aids.

1. Take for example the casting of an opened-up pick-up cartridge, showing the crystal, the leads, the needle connection, the cushioned bed, and the two-part housing. Prepare to do the casting by spreading paper over the workbench. Assemble all material.

2. Roughen the cartridge with glass eraser or sandpaper and wipe with Castolite cleaner. Carefully remove rivets and lay open, leaving the fragile crystal in its place on one side. Wipe exposed inside surfaces with cleaner but avoid touching the crystal. Figure 2.

Key rings



Gears made of polyester plastics

3. Cut 1¼-in. strips of glass and set up on a sheet of glass as shown in Figure 3, and paint the joints with heated parafine. Double-check against pinholes. Do not use the paraffin after it has cooled too much. The box should measure at least 4 by 5 in.

4. Pour enough Castolite into a measuring cup to cover the bottom of the glass box to a depth of 3/16 in. It takes about 3 oz. or 6 tablespoonfuls to do this. Therefore, gauge the amount by the known capacity of the measuring cup. Figure 4.

5. To each tablespoonful poured into the cup, add 3 drops of Castolite hardener; mix, and then add 3 drops of Castolite Promoter. That is, into 3 ounces of resin add 18 drops, total, of both hardener and promoter. Use separate eyedroppers.

6. Mix thoroughly and pour into the glass box, covering its bottom. Bubbles will rise to the top and disappear.

7. The plastic will gel in 20 minutes. Gelation is ordinarily speeded by immersing the mold into warm water, but in this case, a paraffin jointed box may not be so treated.

8. As soon as the smooth surface shows signs of ripples, prepare another batch of resin with hardener and promoter. This should be enough to cover the embedded items completely. Pour the mixture into the box over the first layer. Now, inspect the items to be embedded. Remove any particles of dust.

9. With a cleaned wire crucible tongs, pick up the first side of the cartridge and move it back and forth through the liquid resin in the box to eliminate all bubbles. Set it down on the gelled first layer of plastic.

10. With a dropper or a soda straw feed resin into the space below the crystal and on the inner face of the second housing, and carefully set the assembly next to the first piece. See that both halves are well spaced. Check for bubbles, and allow to gel and cool.

11. The casting is hard in an hour or so. Set it into hot water or oven at 150 deg. for thirty minutes. Water at this temperature begins to steam slightly and fingers may barely be dipped into it. Remove, dry, take the casting from the box, and allow to set for two hours.

12. The bottom and sides of the casting will be quite smooth. File or machine-sand the top. Use coarse and fine file. Sand with two grades, and water-sand with two finer grades. Finish with a buffing wheel to full clarity with triple A compound. Wipe with kerosene and wash with soap.

A Simple Chemical Process

The above directions may sound involved, but they are not. Once through, and the process is learned. It is quite a simple chemical process, and the procedure will become routine after several trials. If students are assigned to this work, one who has been coached and knows what to expect may be entrusted with the careful supervision of directions. It is to be expected that every step must at first be carefully watched.

Buttons in the polyester plastics

No better advice may be offered students beginning an embedment project than to suggest small experiments at first. This leads to the possibility of embedding clover leaves or trout flies in key-ring tags, as shown; or to cast paper weights into light-bulb molds, using a variety of materials for embedment.

The polyester resin, Castolite, featured in this article differs only slightly from Castoglas, featured in the previous four articles in this series. While Castoglas, a laminating plastic, is fairly transparent, its emphasis is upon adhesion while that of Castolite is on transparency. Its clearness is a great advantage, despite the added cure stage which is no hardship. There is nothing in the plastics field or any other for that matter, that can offer a crystal-clear solid made from liquid with which so much can be done at so small an expenditure of effort.

A SAFETY KINK

WHITNEY B. NEWCOMB, JR.
High School
Berwick, Me.

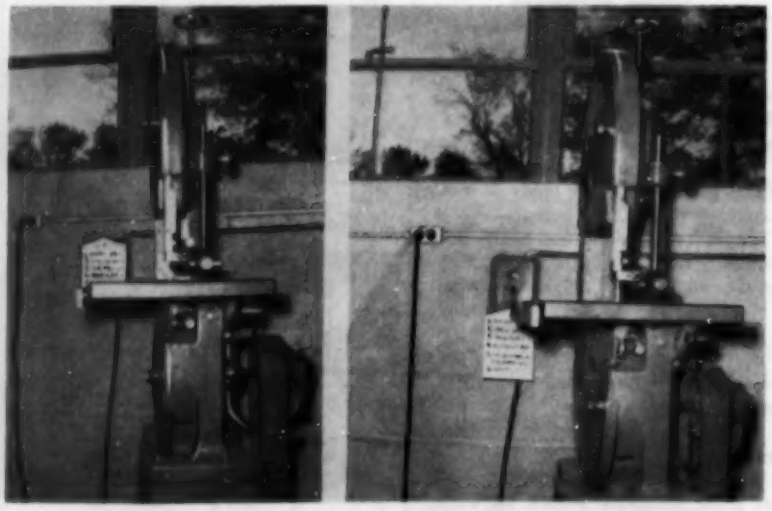
In setting up and teaching an industrial arts or vocational shop, one of the most important factors is that of safety.

Many methods are being used to develop attitudes and habits of safety in the shop pupils. However, in large classes it often becomes difficult to coach the individual in forming these necessary habits in regard to specific machines. In attempting to overcome this problem, and further improve safety measures and attitudes at Berwick High School, the following idea was developed.

The device is a simple card holder of sheet metal, designed to hold a card bearing specific safety rules. The holder is drilled at the top so that it may be hooked in front of the switch buttons while the machine is not in use. It is hooked under the buttons after the rules have been read and while the machine is in use.

Holes may be drilled at the top and bottom of the switch box and small bolts fastened in place. Two nuts are used on the one, leaving the head of the bolt out so that the sign will not slip off too easily. In its lowest position the sign should be placed so that it will not interfere with the manipulation of the switch and thus create a hazard.

It has long been a practice to attach safety signs to machines. Although these signs help to show that the instructor is not negligent, and also bear a warning to those who are to use the machine, nevertheless, they are not always observed, because they become a part of the unnoticed environment and as such do not do the job for which they are intended.



Note position of safety poster before and after

In our school shop, the signs are placed in such a way that the machine operator must come in contact with it both visually and physically. The success of the plan is not without its exceptions. However, the fact that safety reminders must be approached in order to operate the machines, brings the subject of safety closely to mind at a time when it is needed most.

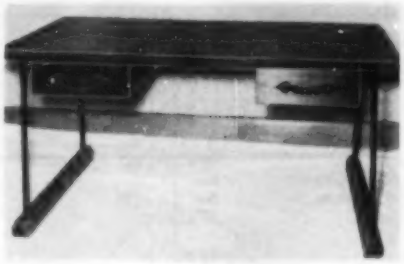
MODERN COFFEE, END, AND CORNER TABLE

DELL REED
High School
Liberal, Kans.

Many of the present-day trends in modern furniture find the tables with wrought-iron legs. Tables of this type can be made in general shops by senior high school students. Woodwork students who do not have access to metal shop may purchase legs at a local welding shop at a much lower rate than regular manufactured ones.

Procedure

1. Cut top to width and length.
2. Cut rails to specified size.
3. Drill holes in top and rails for dowel pins.



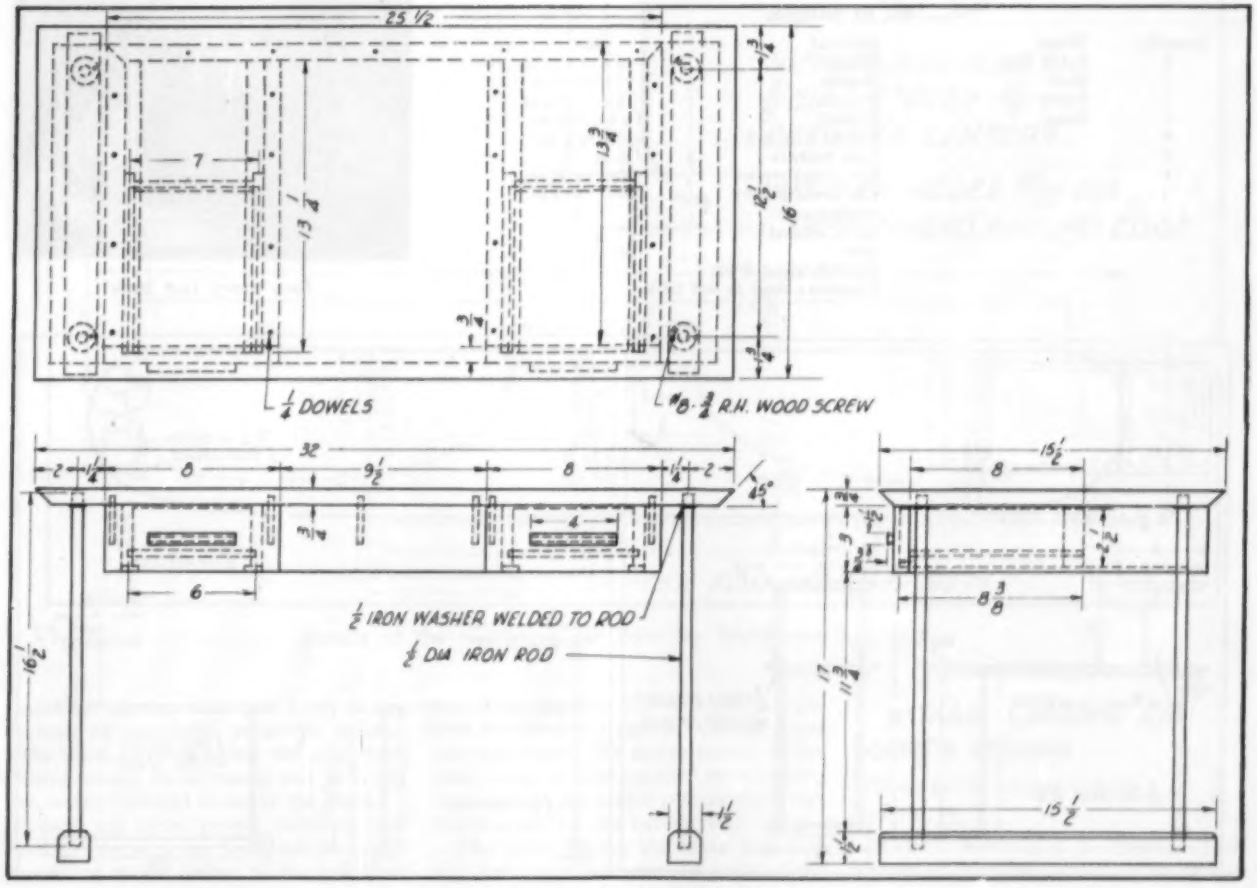
Coffee table

4. Attach drawer slides to rails.
5. Apply rails to table top with dowel pins.
6. Construct drawers as specified.
7. Secure legs as specified.
8. Apply black enamel.
9. Attach legs to table.
10. Cut bases to length and width and drill holes for legs.
11. Attach base to legs.
12. Apply desired wood finish after sanding.

Coffee Table

BILL OF MATERIAL

Quantity	*Name*	*Material*	*Size*
1	Table top	Walnut	¾ x 16 x 32 in.
1	Back rail	Walnut	¾ x 3 x 25½ in.
2	Table base	Walnut	1½ x 1½ x 13½ in.
2	Drawer front	Walnut	¾ x 3 x 8 in.
2	Handles	Walnut	¾ x 1½ x 4 in.
4	Rails	Walnut	¾ x 3 x 13¾
1		Dowel rod	¼ x 30 in.
4		R.h. wood screw	No. 8 x ¾ in.
4	Legs	Round iron rod	½ x 16½ in.
4	Drawer sides	White pine	½ x 8⅜ x 2½ in.
2	Drawer bottom	Plywood	¼ x 6 x 8 in.
2	Drawer backs	White pine	½ x 2½ x 7 in.
4	Drawer slides	White pine	½ x ¾ x 13¼ in.
4	Iron washers		½ in.
	Black enamel for legs		
	Desired wood finish		
	Glue		
	Sandpaper		



Details of the coffee table

End Table

BILL OF MATERIAL

Quantity	*Name*	*Material*	*Size*
1	Table top	Walnut	¾ x 11 x 24 in.
1	Shelf	Walnut	¾ x 9 x 11 in.
2	Risers	Walnut	¾ x 4 x 7½ in.
2	Bases	Walnut	1 x 1 x 9¼ in.
4	Legs	Round iron rod	⅜ x 20¼ in.
4		F.h. wood screws	No. 10
4		R.h. wood screws	No. 8 x ¾ in.
1		Dowel rod	¼ x 30 in.
	Black enamel		
2		Iron washers	⅜ in.
	Glue		
	Desired Finish		
	Sandpaper		

Procedure

1. Cut top to width and length.
2. Cut shelf to width and length.
3. Bevel sides of both shelf and top.
4. Cut risers to width and length.
5. Attach shelf to top with screws and dowel pin.
6. Secure legs as specified.
7. Apply black enamel.
8. Attach legs to table.
9. Cut bases to length and width and drill holes for legs.
10. Attach to legs.
11. Sand and apply desired finish.

End table

Corner Table

BILL OF MATERIAL

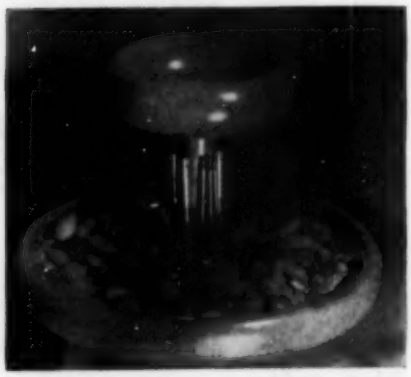
Quantity	*Name*	*Material*	*Size*
1	Table top	Walnut	¾ x 28 x 28 in.
1	Shelf	Walnut	¾ x 9 x 11 in.
2	Risers	Walnut	¾ x 4 x 7½ in
2	Bases	Walnut	1 x 1 x 26½ in.
4		Round iron rod	⅜ x 20¼ in.
4		Iron washers	⅜ in.
4		R.h. wood screws	No. 8 x ¾ in.
4		F.h. wood screws	No. 10 x 2 in.
		Sandpaper	
		Black enamel	
		Glue	
		Desired wood finish	
		Procedure same as end table	

Corner table

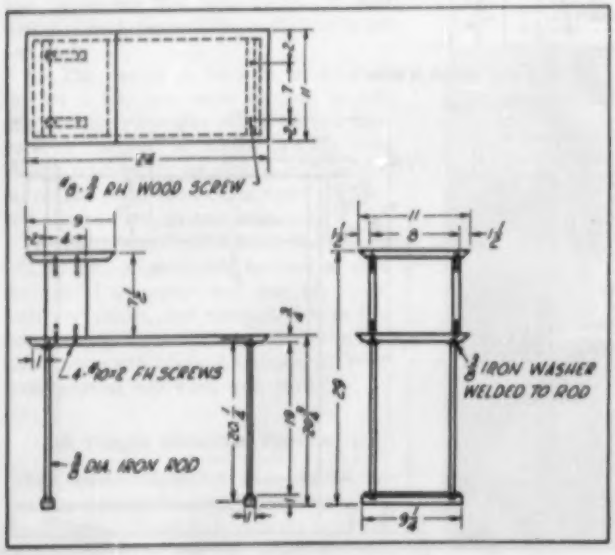
TWO STORY NUT BOWL

WALDEMAR E. KLAMMER
High School
Truman, Minn.

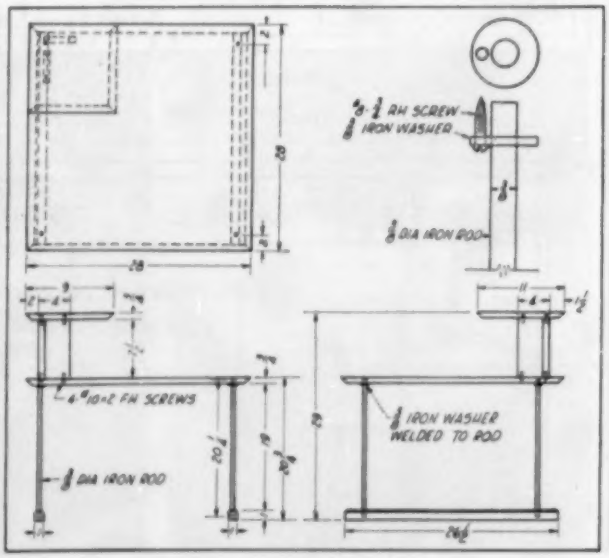
A common complaint, nut shells mixed with the nut meats, prompted the develop-



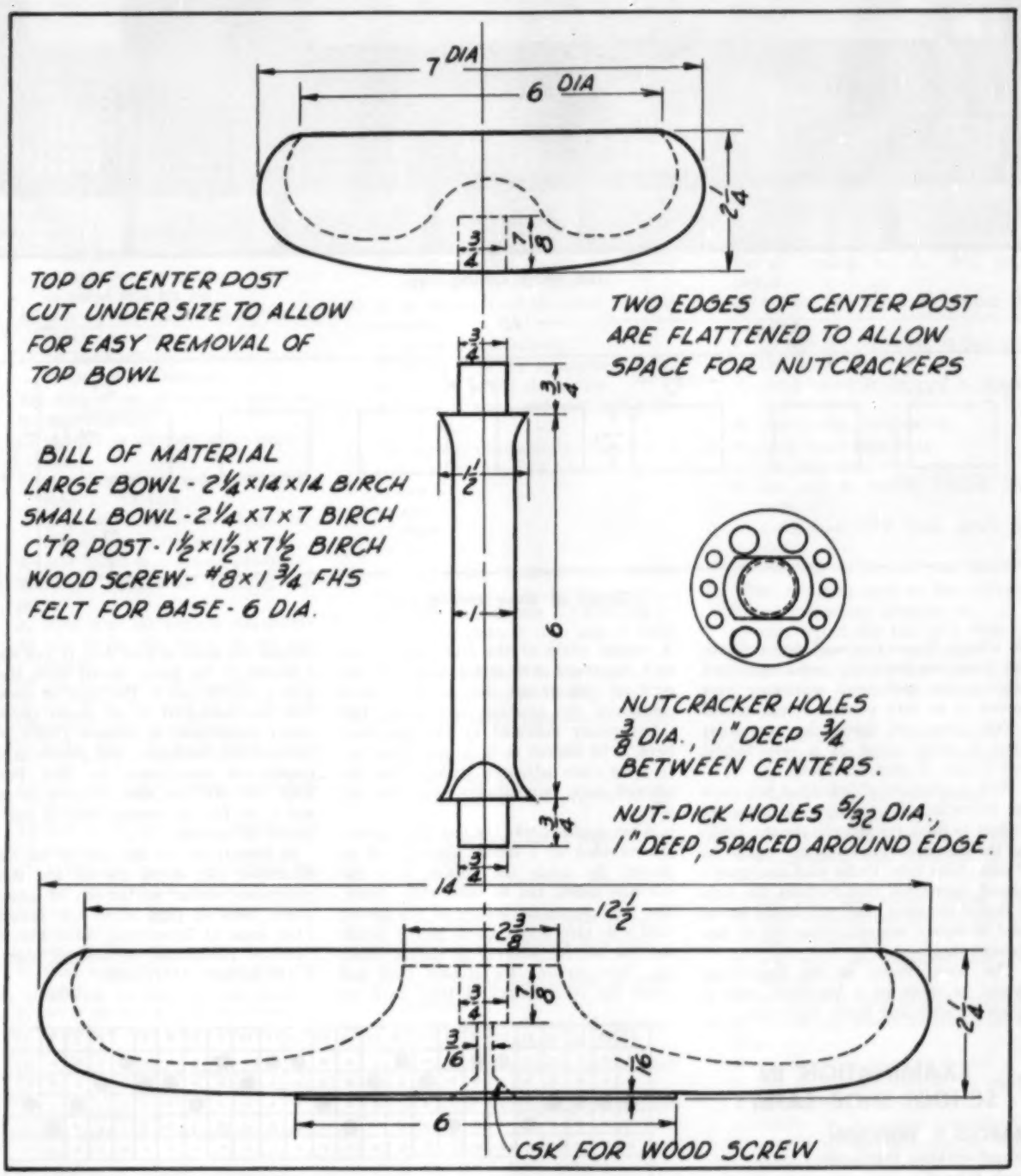
Two story nut bowl



Details of the end table



Details of the corner table



Details of the two story nut bowl by Waldemar E. Klammer

ment of the two story nut bowl. It has proved its usefulness for several seasons. The whole secret is having the upper bowl fitting loosely on the center post so it can be readily removed to empty the shells.

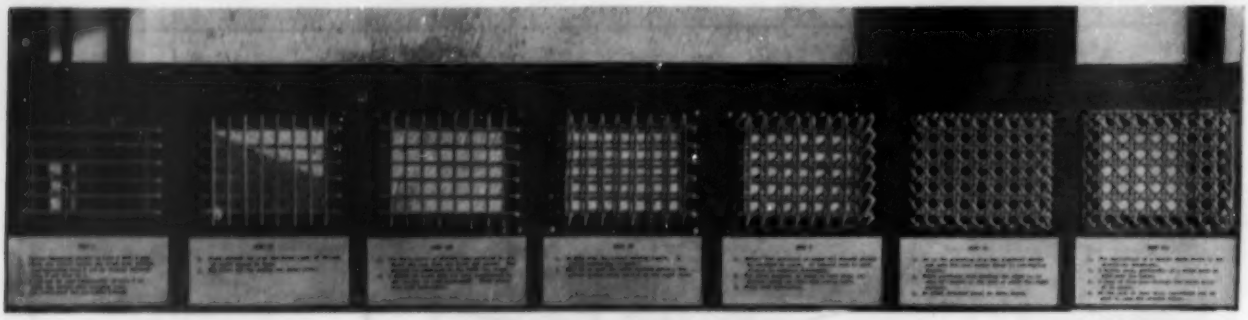
As in any turned project, materials used and the shape of the bowls can be varied according to the desires of the individual as long as certain requirements are maintained. In this case a place must be available for the center post in both the upper and lower bowl. The center portion of the lower bowl is kept smaller by flattening two edges of the center post to allow sufficient space for the nutcrackers.

The screw through the lower bowl and into the center post may be removed for complete disassembly to facilitate storage.

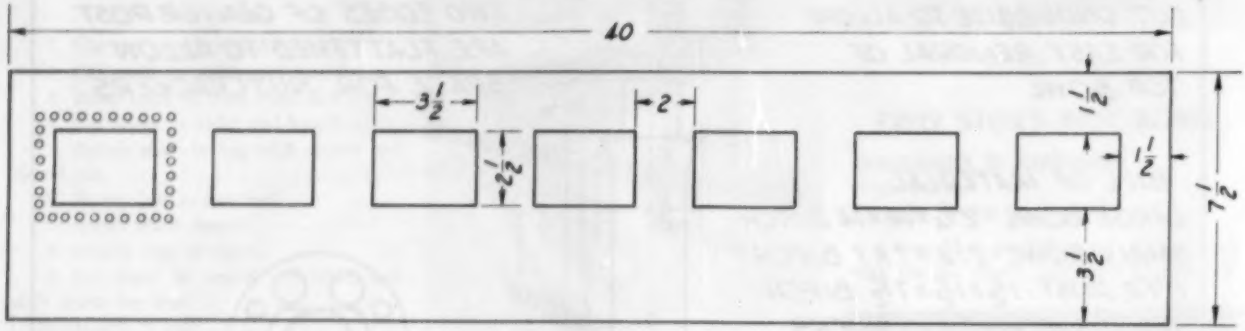
CHAIR CANING AID

ROBERT J. SCHAEFER
Williamsville Central School
Buffalo, N. Y.

With the life span of the American people continually getting longer, adult education is becoming more and more popular in



The chair caning aid



Detail of chair caning aid

our schools. Courses to meet their demands and needs are constantly being organized. Chair caning and wood refinishing have proved to be very popular in our school.

This visual aid shows the progressive steps in chair caning. It is very helpful with a class of about 25 adults.

With a minimum of individual help from the instructor, this teaching aid helps the student to think for himself, thereby bridging the gap when the instructor cannot be of immediate help. Under each operation a labeled instruction card explains the steps in logical sequence. This aid should not be used to replace demonstrations but to supplement them.

The board shown in the illustrations should be made of a hardwood such as maple to withstand heavy treatment.

EXAMINATION IN SCHOOL-SHOP SAFETY

MARCUS E. ERICKSON
Woodworking Instructor
High School
Modesto, Calif.

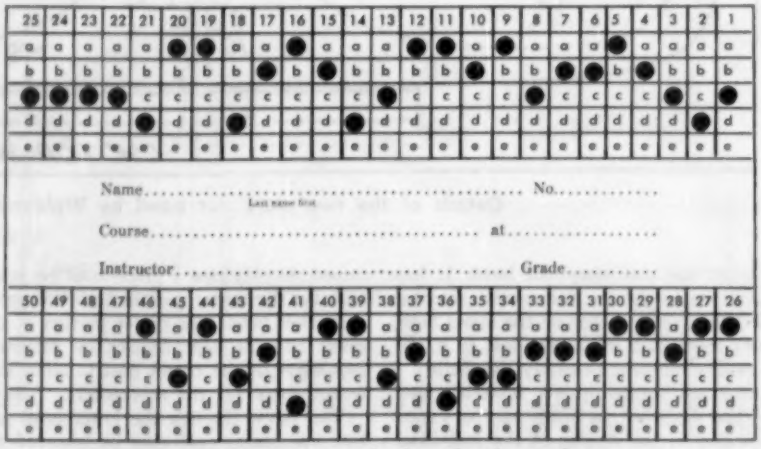
From a health, social, and legal point of view, school-shop safety commands a primary emphasis. The examination that follows covers general safety for all school shops. No attempt has been made to consider those phases that are peculiar to certain specialized areas of shop activity.

Multiple-choice type questions were chosen because it was felt they will do the most to teach shop safety as well as test. A careful study of the four *answers* for each statement will reveal many of the common conceptions that students have concerning the practices mentioned. The safety policy indicated by this test may have to be altered to fit a local situation. In some cases advanced students may be allowed more responsibility than the test offers.

When students take the test, the answers are recorded on a special answer card as shown. By using the answer card the question sheets can be used many times. The most important feature of the answer card is its ease in correction. Merely punch out the correct answers as shown. Place the "*key* card on the student card and count his *cross* marks as they show up through the holes in your *key*. If you want a record of the items missed mark them with a colored pencil. This type of answer card was submitted to our *trades and industry* department by Eugene Dykes, vocational auto mechanics, and printed in the graphic-arts department by Sam Price. With this card the time required to correct a set for the average class is only a matter of minutes.

In preparation for this test we use class discussion, film strips, movies, and study statements similar to the list of general safety rules on page 37 of the January, 1950, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, or those on page 42 of the January, 1947, issue.

Here you will find 46 statements con-



Answer card as punched out by the student

cerning shop safety. Following each statement are four items from which to choose in explaining or completing the statement. After deciding which answer is best for safety reasons place a cross on that letter (*a, b, c* or *d*) for the corresponding question number on your answer card. Mark only one answer for each statement.

1. When the instructor has to leave the room on business, machine operators should:
   a) know where he has gone in case he needs help.
   b) get necessary instructions so he can go ahead with his job.
   c) shut off the machine until the instructor returns.
   d) get some help from another student in case of a breakdown.
2. Throwing scraps of material, nails, etc. at other students:
   a) is good to develop one's sense of aim.
   b) is fun if you are careful not to hit them in the face.
   c) is the best way to get their attention if you want them.
   d) may result in a serious accident.
3. While not using a hot soldering copper:
   a) leave it in the furnace indefinitely.
   b) rest it on the block of sal ammoniac.
   c) rest it on a metal surface.
   d) rest it on the edge of the flu box.
4. When lighting a gas furnace:
   a) make sure the main valve is on first.
   b) light the match before turning on the gas.
   c) turn on the gas before lighting the match.
   d) let the gas run a few seconds before applying the match.
5. If you think your machine needs speeding up:
   a) consult the instructor.
   b) think carefully before changing the speed.
   c) set it up just a little at a time.
   d) determine the speed according to your job.
6. Using a file without a handle:
   a) will cause blisters to develop on your hand.
   b) can result in a dangerous laceration.
   c) may result in poor workmanship.
   d) may ruin the file.
7. When drilling through a piece of material with the drill press:
   a) be sure it is first center-punched.
   b) ease up on the pressure as the drill begins to go through.
   c) use care so as not to burn the drill.
   d) increase the pressure as the drill begins to go through.
8. After the switch is off and the band saw is "coasting":
   a) stop it by lightly applying a small piece of wood to the blade.
   b) slow it to a stop by applying pressure to the belt or flywheel.
   c) let it come to a dead stop by itself.
   d) continue to saw until it stops.
9. You will be most likely to be hit by flying chips from the circular saw:
   a) when standing behind the operator.
   b) when standing on the side of the saw to the right of the operator.
   c) when standing on the side of the saw to the left of the operator.
   d) when standing on the side of the saw opposite the operator.
10. If an electric cord or switch is found defective:
    a) repair it immediately.
    b) report it to the instructor.
    c) call the school electrician.
    d) leave it alone and stop using the machine.
11. The number of operators allowed on a buffer at one time (is) (are):
    a) one.
    b) two.
    c) three.
    d) four.
12. If you injure yourself — no matter how slight:
    a) apply immediately for first aid.
    b) keep it clean if it is only a small cut.
    c) go immediately to the nurse.
    d) get some student to help you.
13. Heavy and bulky materials should be stored:
    a) on the floor.
    b) in a closed cabinet.
    c) where they do not project or fall out.
    d) in a storeroom where students will not enter.
14. To get objects too high for you to reach:
    a) have someone boost you up to it.
    b) knock it down with a long stick.
    c) jump for it.
    d) use a strong box, ladder, or other support.
15. Rags that contain linseed oil, gasoline, paint, and dope should be stored:
    a) in metal containers with open cover.
    b) in metal containers with tight cover.
    c) in the cleaning rag box.
    d) in the paint table drawer.
16. Handle sheet metal with care because:
    a) it may have sharp edges.
    b) it may bend and be ruined.
    c) it is easily scratched.
    d) it is easily marked with fingerprints.
17. To protect the eyes while using the grinder, lathe, and sander:
    a) stand well out of the path of flying particles.
    b) wear an eye shield or a pair of goggles.
    c) close your eyes part way.
    d) make sure the machine is in good order.
18. Although hand tools and machines are designed for a specific use they may be used for some other purpose:
    a) when the tool or machine needed is not available.
    b) when the machine or tool needed is not handy.
    c) when the machine or tool needed is in use.
    d) never.
19. Before turning on the drill press switch:
    a) remove the chuck key from the chuck.
    b) be sure the chuck key is tightly in the chuck.
    c) check to see if the cord is plugged in the outlet.
    d) turn on the main switch.
20. In using sharp edge tools:
    a) cut away from the body.
    b) use care in cutting toward your body.
    c) make sure your tools aren't too sharp.
    d) cut away or toward your body.
21. When returning tools to the toolroom it is good safety practice to:
    a) only return one tool at a time.
    b) toss them to the tool man.
    c) pile them on the tool issue shelf.
    d) lay them carefully on the tool issue shelf.
22. If you have to lift a heavy object:
    a) be sure you have the strength to do it.
    b) "heave" with all your might.
    c) know how to do it first.
    d) show your buddy how it is done.
23. When handling long materials in the shop:
    a) cut them into smaller pieces first.
    b) most students will see you and get out of your way.
    c) use care and consideration for others.
    d) go ahead as with smaller materials.
24. If you see any unsafe conditions in the shop:
    a) do something to make it safe.
    b) tell one of the students to notify the instructor.
    c) notify the instructor immediately.
    d) pass it up as the instructor must know about it.
25. More than one operator on a machine:
    a) gives more students a chance to use the machine.
    b) is a good way to teach another student.
    c) can be very dangerous practice.
    d) shouldn't be dangerous if both are careful.
26. *If* you are permitted to operate the main panel switch:
    a) be sure the machine switches are off first.

b) be sure the fuse is O.K.
c) turn on the machine switches first.
d) remove the fuse first.

27. Scrap from your work should be:
a) put in the scrap box.
b) left on the bench.
c) thrown on the floor.
d) thrown at other students.

28. Machine safety guards:
a) may be removed for most machine operation.
b) should be in place during operation.
c) removed if you will have to change belt speeds several times.
d) need only be in place for certain operations.

29. After you have "set up" and adjusted your machine:
a) have it checked by the instructor.
b) go ahead and finish your job.
c) have another good student check it.
d) try it out before having it checked.

30. Before turning on your machine switch:
a) be sure everything is O.K.
b) check the main switch to see if it is on.
c) hold the belt so the machine starts slowly.
d) call the instructor for a check.

31. Before leaving a machine:
a) get the instructor's permission.
b) shut off the power.
c) have your buddy watch the machine.
d) leave it running if you will be right back.

32. Machine adjustments and oiling:
a) can be done while the machine is running if you are careful.
b) are done only while the machine is not running.
c) are easier when the machine is running.
d) are done either with the machine stopped or running.

33. When in doubt about the operation of a machine:
a) call your buddy for help.
b) call the instructor.
c) experiment a little.
d) go right ahead and do your job.

34. When operating a machine loose clothing:
a) will cause you little trouble if the guard is on.
b) can be ignored.
c) must be secured or fastened out of the way.
d) may get torn.

35. If you must watch a machine operator:
a) stand where he can see you.
b) stand so you can see the best.
c) stand well outside the safety lines.
d) stand within the safety lines if you can see better.

36. Interference with a machine operator:
a) may be permitted if he knows you are there.
b) is permitted only with the instructor's consent.
c) teaches the operator to be on the alert.
d) is never permitted under any condition.

37. If a machine needs repair or suddenly stops:
a) go right on using it but be careful.
b) report it immediately to the instructor.
c) repair it and then go on with your job.
d) get someone to repair it for you.

38. Who should start and stop the machine you are operating?
a) The instructor.
b) Your buddy.
c) You.
d) An observer.

39. *Practice* on machines in your spare time.
a) is never permitted.
b) is a good way to learn.
c) is permitted if you ask the instructor.
d) is permitted anytime if you know the machine.

40. When must you get permission to operate a machine?
a) Always.
b) Only for certain machines.
c) Only if you are in the ninth grade.
d) Only when operating it alone.

41. Running and playing in the shop:
a) must be done between classes.
b) must be kept as quiet as possible.
c) must be stopped if machines are being operated.
d) is never permitted.

42. Playing at the sink:
a) is not too serious as far as accidents are concerned.
b) is not permitted at anytime.
c) should be kept to a minimum.
d) is permitted if machines are not operating.

43. Playing in the shop is not permitted because:
a) the instructor thinks you may get too tired.
b) the instructor wants to make life boring for you.
c) it may be the cause of a serious accident.
d) you will have to be sent to the office.

44. In general you are:
a) not permitted to operate the switches on the main panel.
b) permitted to operate the switches on the main panel.
c) permitted to operate the switches on the main panel if the instructor is in the room.
d) permitted to operate the switches on the main panel if the instructor is out of the room.

45. Under which of the following conditions may an accident easily happen:
a) when you are concentrating on your work.
b) when you are sitting on the bench doing nothing.
c) just roaming around the shop when out of work.
d) while using a machine.

46. When you are not using a machine on your project:
a) keep your hands away from it.
b) check it to see that all is in order.
c) turn all knobs until they are tight.
d) experiment with it.

BEAUTIFYING AND PROTECTING WOOD SURFACES

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There is great need for better understanding of the beautification and protection of the wood surface. Better understanding can be obtained through study, research work, or years of experience. Information describing reasons why we paint, types of finishes, the life of the paint film, wood characteristics that affect paint, quality of paint, application of paint, and techniques of exterior and interior finishing should be a part of the training program leading to better protection of the wood surface.

The author of this article has had the splendid opportunity of collaborating with the technicians and engineers of the Forest Products Laboratory at Madison, Wis. He wishes to express his appreciation to them for their fine co-operation in helping him to obtain valuable and helpful technical information. He has taught finishing, and also painting and decorating, at the college level for the past ten years and has appeared as a lecturer on finishing at various conventions throughout the Northwest.

Reasons Why We Paint

1. Protection against moisture and weather: Paint minimizes the expansion and contraction of wood by retarding changes in moisture content.
2. Improvement and maintenance of appearance
   a) Paint and enamel: These products are opaque finishes that hide the grain of wood, as well as certain of its imperfections, and substitute color, sheen, and individualistic textures in place of the texture of the wood surface.
   b) Varnish, lacquer, and oil: These are transparent finishes that reveal the texture and character of the grain of any wood. When stain is used prior

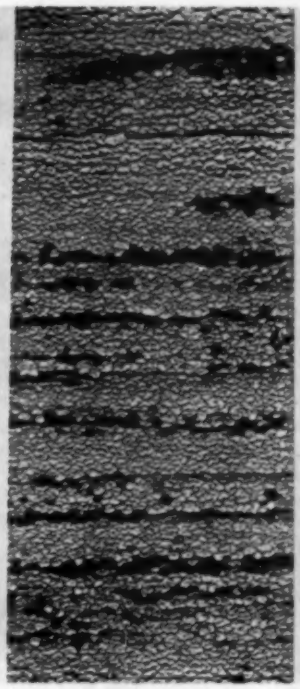

Fig. 1. Cleaning siding during the soiling stage. (Center) Fig. 2. Checking. (Right) Fig. 6. Advanced disintegration

to a coat of varnish, lacquer or oil, the color of the wood surface is changed.

c) Stain: Stain alone, without the application of varnish or lacquer, alters the color but not the sheen or texture of the wood.

3. Improvement of lighting: Painting a surface to a lighter and brighter finish greatly improves lighting effects and makes any room appear larger.
4. Protection against fire: It has been found that paint reduces fire hazard up to 400 per cent.

Types of Finishes

1. Penetrating or intrasurface finish: A penetrating or intrasurface finish is achieved by merely saturating a surface with drying oils, various commercial sealers, or a diluted coat of varnish or lacquer.
2. Surface finish: Surface finishing exists when all or most of the liquid applied remains on the surface in thicknesses ranging from .001 inch to preferably not more than .005 inch. Varnish, lacquer, shellac, paint, or enamel applied over a well-sealed or well-primed surface provides such a coating.

Life of the Paint Film

The nature of any wood has very little effect upon the life of a protective coating for the first year or two after such a coating has been applied. After that time, when the coating becomes embrittled with age, differences between woods become an important factor in determining the rate at which the coating disintegrates. Under normal conditions, disintegration takes place most rapidly where the greatest amount of sunshine falls, and then proceeds always through the following, but overlapping stages:

1. The soiling stage, in which the coating becomes dirty.
2. The flatting stage, in which the coating loses its sheen or gloss.
3. The chalking stage: A limited amount of chalking is desirable in a good white house paint, but less desirable in colored

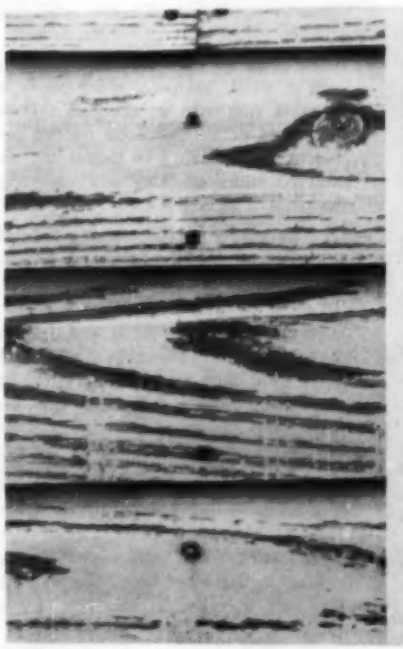
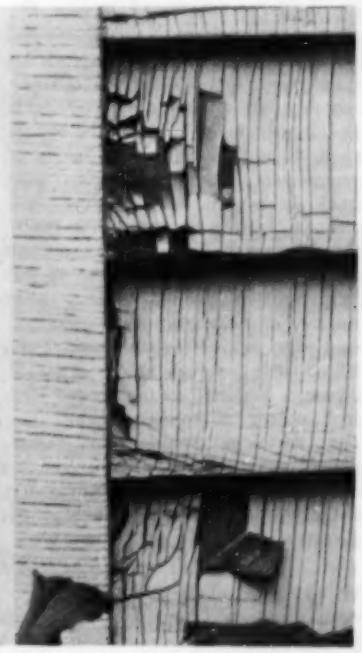

Fig. 3. Cracking. (Right) Fig. 4. Disintegration over summerwood

paint. A limited-chalking white paint will appear clean and white after a rain, leaving an excellent surface for repainting. Chalking, however, causes colored paint to fade. Because of the chalking which normally occurs, it is wise not to add color pigment to outside white. Therefore, insist upon using tinting white because it is specially formulated to permit the addition of color pigment and very little if any chalking will occur. Because of this fact, the surface is not self-cleaning and, within a year or two, cleaning becomes necessary. With a long-handled brush of the type used for cleaning store windows, and a pail of warm water with detergent added, the surface can be made to look like new. Brush the soapy water onto the surface, Figure 1, starting from the bottom, and slush off with clean water from a garden hose. Prior to cleaning, the surface may appear to need repainting, when actually all it needs is a good cleaning.

4. The fissure or splitting stage: Under favorable conditions, a paint film may skip this stage. Checking, Figure 2, a condition which appears as slight breaks in the surface of the paint film, is one form of fissure. Cracking is another type of fissure in which the underlying surface is visible through the cracks. Cracking, Figure 3, usually makes its appearance in the more advanced stage of paint embrittlement.
5. The disintegration stage: The rate at which a paint film disintegrates is greatly determined by its behavior during the fissure stage. Paint that chalks excessively may escape the fissure stage but, at the same time, wastes away by erosion until the bare wood appears. Because of the hardness of the surface and the size of wood cell cavities of the summerwood in softwoods, disintegration proceeds much more rapidly over the summerwood than over the springwood, Figure 4. Over wide bands of summerwood, disintegration is quite rapid, leaving the bare area very conspicuous. During the process of checking, check marks become interwoven and penetrate deeply into the painted surface; tiny fragments of the coating break or crumble away. When the loosened edges in cracking curl outward and fall off, that process is known as flaking, Figure 5. Flaking is a more rapid form of disintegration than crumbling.
6. The advanced disintegration stage: Enough wood has been laid bare at this stage to permit rapid weathering and, if the wood is left unprotected, serious disintegration will occur, Figure 6.

Wood Characteristics That Affect Paint

1. Lightweight wood holds paint better than heavy wood because lightweight wood contains very little summerwood.
2. Narrow-ringed wood holds paint better than wide-ringed wood because less summerwood is present in the narrow-ringed material and thus the paint film has a tendency to secure itself to the springwood and bridge over the narrow summerwood bands.
3. Paint holds better on edge-grain than on flat-grain wood because of the narrow bands of summerwood in the edge-grain material.
4. When using flat-grain lumber in building, keep in mind that paint holds better on the bark side than on the pith side for the bands of summerwood on the pith side have a tendency to loosen and curl outward, thus cracking and dislodging the paint film.
5. Lumber cut from the center of a tree is likely to be wider-ringed and does not hold paint as well as lumber cut from the outer portion of the log.
6. High-grade lumber holds paint better than low-grade lumber because of the absence in high-grade lumber of knots and other defects which do not hold paint well, Figure 7.
7. Extractives in certain lumber may have an effect upon the life of the paint film. The resins of the white and yellow pines, for instance, have a detrimental effect upon paint films which contain zinc oxide. On the other hand, the water extractives in redwood and the oily extractives in southern cypress have a tendency to increase the durability of a paint film.

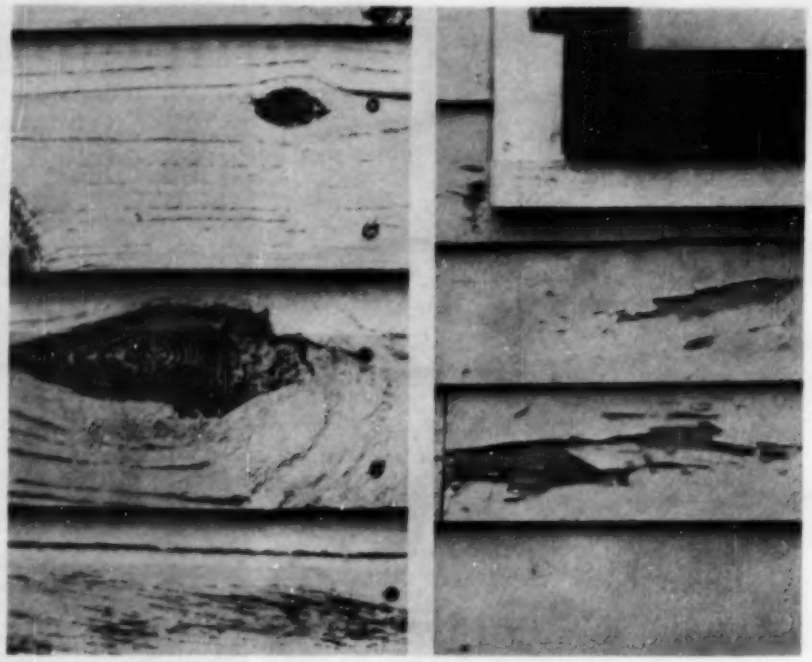

Fig. 5. Flaking. (Right) Fig. 7. Disintegration over knots

Quality of the Paint

Use of the best quality house paint is recommended on nearly all jobs of exterior painting. More labor is required to paint a surface with a low quality paint because more coats of the low quality paint are required originally, and later the wood surface requires repainting more often. As the cost of labor is several times the cost of paint, use of high quality paint is cheaper. The quality of paint depends upon three main factors, all of which are controlled entirely by the paint manufacturer:

1. Quality of the liquid: The quality of the liquid is of utmost importance in paint manufacture. Linseed oil, extracted from flaxseed, is the most widely used liquid constituting the vehicle in house paints. Raw or refined linseed oil has about the same viscosity that it had at the time of extraction. Boiled linseed oil is heated raw oil into which driers have been incorporated to make the oil dry in approximately 16 hours rather than in 70 hours. Boiled linseed oil is raw oil that has been heated to between 550 degrees to 650 deg. F. to increase its viscosity. Other oils, such as soybean oil, are used to substitute certain proportions of the linseed oil without impairing the quality of the finished product. Varnishes are seldom used in exterior house paints, but varnishes are used extensively as the main vehicle in such exterior enamels as porch and deck enamel and in trim paints. The thinner portion of the vehicle in most paints consists of turpentine, a vegetable oil obtained from the

long-leaf pine tree, and of mineral spirits, a petroleum product.

2. Quality of the pigment: The quality of the pigment is equally important in the manufacture of a high quality paint. However, no one paint remains superior during each stage of disintegration mentioned earlier in this article. The improvement of one stage is usually achieved at the sacrifice of another stage. For effective paint maintenance, a painter should know the pigment composition of his paint and how it may react during the different stages of disintegration. White lead, titanium dioxide, and zinc oxide are the main opaque pigments. For convenience, white paint may be grouped into the following categories: pure white lead paint; mixed-pigment paints of white lead, titanium dioxide, and zinc oxide; and mixed-pigment paints which contain titanium dioxide and zinc oxide, omitting white lead entirely.
   a) White lead paints: These paints may become very dirty during the soiling and flatting stage. Chalking and fading in tinted paint of this type set in early. Such paint applied to the sunny exposures of a house may contrast greatly with the more shaded portion of the same house. Checking begins quite early in white lead paints, but they do resist adverse conditions of service. Such paints permit wide differences in a maintenance program in that surfaces painted with white lead paints can be repainted more frequently than surfaces painted with other types of paint. Repainting of those surfaces which had previously been painted with white lead can be postponed into the more advanced stage of disintegration without necessitating an expensive surface repair. Painting first with white lead paint provides an excellent foundation for mixed-pigment paint, but the reverse order may cause serious checking and alligatoring.
   b) Mixed-pigment paints, titanium-lead-zinc paint: These paints remain quite clean during the soiling and flatting stage, but during the chalking stage, chalk from such paints may wash off onto colored house trim. Chalking, however, may be controlled by varying the amounts of titanium pigments which are made in different degrees of chalking. Zinc oxide also has a tendency to reduce chalking.
   c) Mixed-pigment paints, titanium-zinc paint: Titanium-zinc paints, having less tendency to check and crack, may skip the fissure stage entirely. They provide an excellent surface for repainting because titanium-zinc paint disintegrates almost entirely by erosion of the paint film.
3. Proportions of pigment and vehicle: Although there are no generally recognized standards of paint quality, the proportion by weight in a good house paint should be about 65 per cent pigment and 35 per cent vehicle. If the amount of pigment is too great, the film is likely to chalk and fade. If the vehicle content is too great, the film may crack and curl during the fissure stage.

Application of the Paint

1. Never paint wood that is damp or wet.
2. Never paint in the rain or if rain seems probable.
3. Painting wood which possesses 16 to 20 per cent moisture content assures longer paint life than painting wood with a 10 per cent content.
4. Allow sufficient drying time between coats. Plan for two or three days of drying unless the weather is warm and dry.
5. On new homes that have been completed in the fall, do not apply only a priming coat and then wait until spring to continue painting. Instead, apply a coat of water-repellent preservative and then wait until spring to do the entire job of painting.
6. A three coat job — in which a priming coat, a second coat, and a finish coat are applied — is superior to a two-coat job, unless great care is taken with the two-coat job to assure application of sufficient film thickness.
7. Prime with a primer, which is a special formulation for priming. Do not use thinned-out finishing-coat material for priming purposes.
8. When using ready-mixed paint, avoid adding thinner or oil because these additives may increase the possibility of wrinkling as the paint dries.
9. Back priming is a good practice, but is usually eliminated because of the expense and inconvenience of doing part of the painting prior to erection of the building.

Natural Finish for Exterior Woodwork

Natural exterior finishes are used sparingly because they are much less durable and require more frequent renewals than pigmented house paints. Renewals at least once a year may be necessary where a naturally finished wall is exposed to sun and rain. Four types of finishes are available for exterior finishes:

1. Varnish is used where a glossy finish is desired; however, after several recoats, the film has a tendency to crack and darken.
2. Penetrating sealer may be used to give a low gloss finish. One coat may be sufficient, but often two coats are applied. Care must be taken to wipe off all excess sealer that is not absorbed by the surface. An additional coat may be applied later when renewal is necessary.
3. Drying oil, such as linseed oil, may be used much in the same way that a penetrating sealer is employed.
4. Nondrying oils containing wax and other nonvolatile ingredients are also used. Their use results in an appearance much the same as that achieved from penetrating sealer.

Into many of the sealer and oil finishes, a small amount of color is incorporated to increase the durability of that finish and to uniform the variations of the natural color of the wood.

Interior Finishes

Interior finishes differ greatly from exterior finishes because less protection from moisture is needed in interior work where appearance is the main purpose. Interior finishes may be classified as either opaque or transparent. Smoother film surface, better color, and a more lasting sheen are expected of an interior finish and for that reason enamels instead of paint are used. To create the vehicle of such enamels, a greater amount of bodied oils and varnish replaces the drying oil ordinarily used. This procedure permits a more even flow of the film in application and assures a harder surface after drying.

All surfaces to be enameled should first be sanded with 3/0 to 5/0 abrasive paper, because imperfections are accentuated by enamel finishes. The raised grain of the heavier softwoods, of which fir is typical, may give trouble because during the process of milling, the hard bands of summerwood are often pressed into the softwood and these bands push up again when the wood reaches its (E.M.C.) equilibrium moisture content at which the wood renders service. The ugly cracks that frequently appear in the paint film may be minimized greatly by giving an application of tung oil or similar drying oils to the surface, prior to the application of the primer or undercoat. Knots in pine must be treated with shellac, aluminum paint, or a special knot sealer to prevent exudation of the sap and discoloration of the paint film.

Transparent finishes are often used when the wood itself possesses a pleasing natural characteristic or color. Stain is frequently employed to provide more color and to accentuate grain variations. Staining of softwood gives an effect that is not entirely pleasing because the soft springwood absorbs much more stain than the summerwood. Pigmented uniforming oil stains are much more suitable for the staining of softwoods because such stains do not possess the penetrating characteristics of other stains.

A clear sealer is applied prior to staining in order to uniform the texture of many softwoods and some hardwoods. This procedure provides a greater uniformity of staining. To obtain a smooth finish, filler

must be used on porous woods prior to the application of the surface coating.

Shellac, varnish, and lacquer are transparent surface coatings that may be used. Some finishers include wax, but when it is used alone, wax does not produce a finish. It may be used over surface coatings to produce luster and greater sheen. Varnish and lacquer of the rubbing and polishing type are used where the finisher desires a rubdown finish. These materials possess a greater resinous content than do materials of the nonrubbing type. Fine abrasive paper, pumice and oil, or rubbing compound are used for final rubbing and polishing.

Floors, too, can be finished with an opaque or transparent finish. Whatever product is selected, the surface coating must be of a type that will resist mechanical wear. Recoating must be done before the old coat of finish has worn down to the bare floor. Floor sealers are widely used for floor maintenance in residences as well as in public buildings. These sealers do not give entirely adequate protection against moisture and dirt, but they are very easy to maintain. Signs of wear in floor sealers are not so noticeable as in the case with surface coatings because the sealer and floor wear down together. In the application of floor sealers, the sealer should be rubbed into the surface and any excess wiped off. When dry, the sealer should be buffed with fine steel wool. Wax can then be applied over the sealer, but wax may give serious trouble when recoating of the surface becomes necessary.

DRAFTING DESK AND SWIVEL T SQUARE

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One of the major problems confronting a drafting teacher is the method of holding down the paper on the drafting desk.

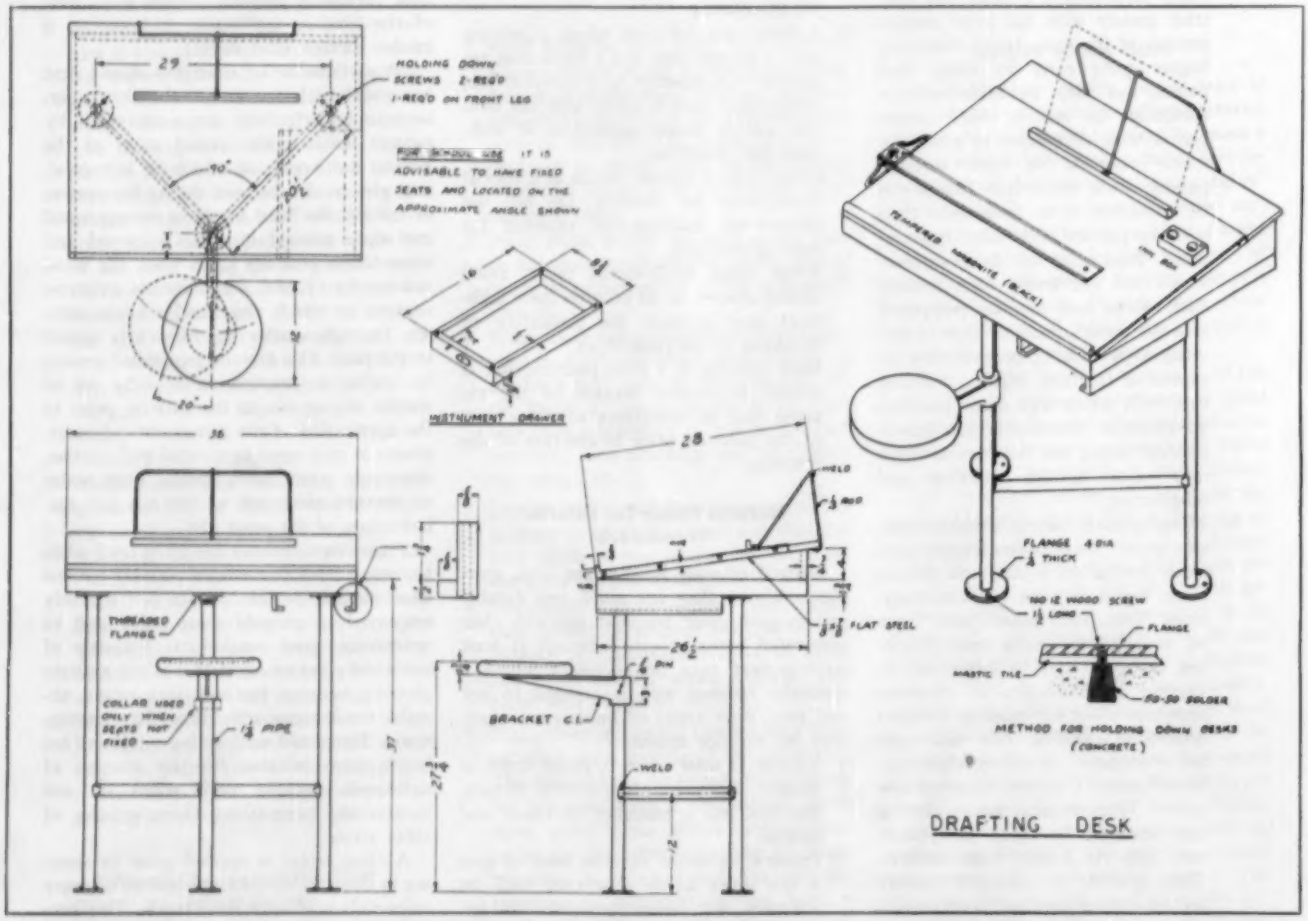
Thumbtacks have the atrocious habit of falling on the stools with the points perpendicular to the horizontal plane. Drafting tape is usually found in use in industrial drafting rooms, and this method is far superior to tacks and staplers.

The desk top illustrated has been found very handy and useful at the Kitchener and Waterloo Collegiate and Vocational School.

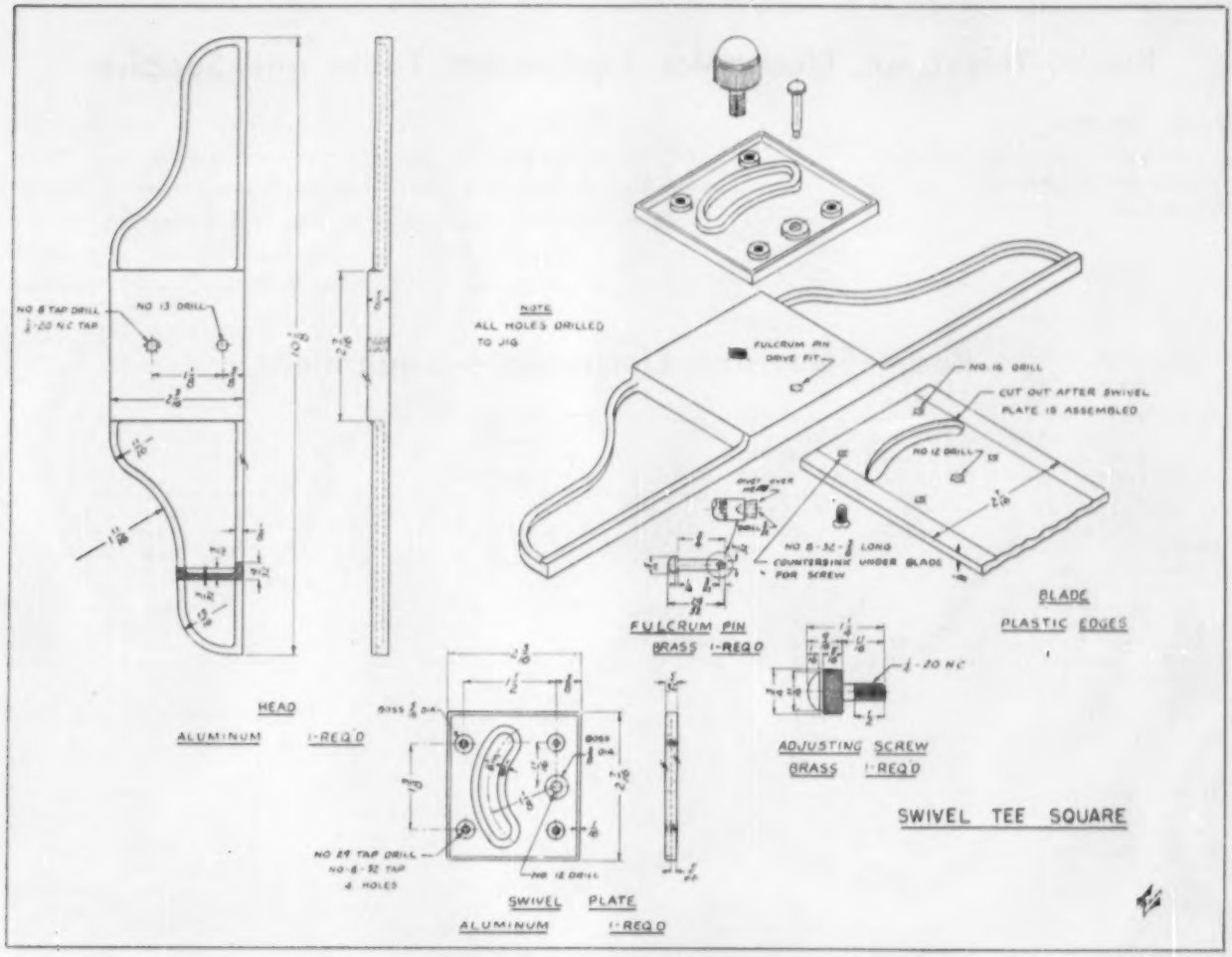
The swivel T square illustrated herewith will also be found handy when the student finds it necessary to change his drawing from one table to another. It is quite obvious that if the student changes his desk before the drawing is completed, the correct method is to square the last T square with one of the horizontal lines on the drawing.

Some difficulty might be experienced in holding the desk firmly to a cement floor; therefore, a method is hereby given which is much superior to expansion bolts, etc.:

1. Use a ½-in. hammer drill.
2. Channel a cone-shaped depression with a cold chisel.
3. Pour in the hole 50-50 solder (very hot).
4. Drill a 9/32-in. hole 1¼ in. deep.
5. Drill a 9/32-in. hole ⅝ in. deep.
6. Use a No. 12, 1½ in. long wood screw.


HOLDING DOWN SCREWS 2-REQD 1-REQD ON FRONT LEG
FOR SCHOOL USE IT IS ADVISABLE TO HAVE FIXED SEATS AND LOCATED ON THE APPROXIMATE ANGLE SHOWN
INSTRUMENT DRAWER
THREADED FLANGE
COLLAR USED ONLY WHEN SEATS NOT FIXED
1½ PIPE
BRACKET C.I.
WELD
FLAT STEEL
FLANGE 4 DIA ¼ THICK
NO 12 WOOD SCREW 1½ LONG
FLANGE
MASTIC TILE
50-50 SOLDER
METHOD FOR HOLDING DOWN DESKS (CONCRETE)
DRAFTING DESK

Details of the drafting desk



Details of the swivel T square

The drafting desk and T square are excellent projects for a vocational school which may require new equipment. The shops that would profit from this project are drafting, pattern, wood, welding, molding, and machine.

INDUSTRIAL ARTS CONTRIBUTES TO EFFECTIVE LIVING

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Industrial arts is concerned, primarily, with offering many and varied opportunities for each individual to develop appreciations, understandings, and abilities that will assist him in meeting life situations.

This is done through learning by planning and doing useful things in an atmosphere conducive to such learning in a planning room, shop, or laboratory where the necessary materials, tools, and equipment are available.

The things planned or constructed may be directly related to everyday problems, to problems of the home or its surroundings, or to many of the arts and crafts which provide for creative expression, personal satisfaction, or foundations for future interests or leisure-time hobbies, "do-it-yourself" activities, or other enterprises.

Specifically industrial arts functions in the following ways:

1. It emphasizes individual and group problem solving with concrete materials where there is opportunity to put ideas into practice and observe or measure the results.
2. It emphasizes purposeful thinking and planning.
3. It offers a working knowledege and understanding of the most basic method of communication; drawing, the universal language.
4. It develops interests in new ideas, study and research in connection with projects undertaken.
5. It assists in developing ingenuity in working out original problems.
6. It develops an appreciation of the work of others.
7. It assists one to do neater and more accurate work in any undertaking.
8. It offers opportunity for exchange of ideas and co-operative planning.
9. It provides for invention and experimentation.
10. It emphasizes a basic problem-solving procedure applicable to any problem in life situations.
11. It assists in understanding consumer problems and economic problems of industry and business.
12. It helps many students to *find themselves* through outstanding success in some phase of the work.

Twenty trains of 100 tank cars each would be needed to move the 440,000 barrels of oil which will be carried daily through the new 26-inch West Texas Gulf system pipe line in Texas. — *Petroleum Newsnotes.*

Radio, Television, Electronics, Equipment, Tools, and Supplies

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The following listings for Radio-TV training includes all basic necessities. The supply lists include only those supplies which are standard requirements and do not include specific parts and accessories necessary to the repair of specific Radio-TV units. Equipment and small tools are adequate to instruct a class of 16–20 trainees.

Radio–Television Electronics — Equipment

AMMETER
1. AC, capacity 0–1, 0–2, 0–3, 0–5, 0–10, 0–25, 0–50
2. RF, capacity 0–1, 0–1.5, 0–2, 0–3, 0–5
3. DC, capacity 0–1, 0–2, 0–3, 0–5, 0–10, 0–25

ANALYZER — Capacitator bridge type, capacitance range 1mmf to 2000 mfd, resistance range 2.5 ohms to 25 megohms

BATTERY, TESTER — Built in load circuits. 9 pre-fixed positions, provided with blank positions and test prods.

BENCH, RADIO-TV SERVICING — Equipped with 120/240 volt, single phase, a.c. 240 volt, 3 phase a.c., 0–240 volt d.c., 120 volt, 400–800 cycles a.c.

BENCH, SOLDERING — 30 by 32 in. by 8 ft. or similar wired for electric soldering irons

BRAKE, SHEETMETAL — 36, 48, or 60 in., hand operated, capacity 18 gauge

CABINET
1. Small parts, multi drawer, 2, 4, 6, 8, 10, 14, and 18 drawers, metal or wood
2. Storage, general, open or closed, metal

CHECKER, GERANIUM DIODE — Scales, 0.3, 1.2, 6, 12 ma., voltages 3, 12, 120, with rectifier and test clips, 105–125 volts, 50–60 cycle a.c.

CLIPPER, SINE WAVE — 4-position wave selector, output volume control, input and output terminals

DRILL, ELECTRIC — ¼ in. Midget, 115 volt a.c.–d.c., 3 conductor 1150 r.p.m., full load, geared chuck

DRILL, PRESS — Floor or bench type, ½ h.p., 115 v., a.c. 50/60 cycle, or 1 h.p. 220 v., 3 phase a.c. 50–60 cycle, 1725 r.p.m., 10 by 10 in. working table, ½ in. capacity

ELIMINATOR, BATTERY — ATR–"A," 6 volts at 10 amperes or 6 volts at 20 amperes or 12 volts at 10 amperes, 105–125 v., 50–60 cycles, voltage control switch

GALVANOMETER, DC — 500–0–500 micro amperes, 75–0–75 micro amperes

GENERATOR
1. TV Sweep, preset switch positions, channels 2–13, 1F coverage 300 Kc–50 MC, 105–125 v., 50–60 cycles a.c.
2. Sweep & Marker for VHF-TV band, coverage 470–870 MC, variable sweep width, 105–125 v., 50–60 cycles a.c.
3. VHF–FM, 0–50 MC heterodyned output, basic output all channels .5 volt, continuously variable tuning

GRINDER, ELECTRIC — Floor or bench, 6 or 8 in., ⅓ h.p., 115 v., single phase, 50–60 cycle, 3600 r.p.m. or ½ h.p., 220 v., 3 phase, 50–60 cycle a.c.

MARKER — Crystal controlled, 15 position switch, side band and simultaneous 1F marker

MICROAMMETER, DC — Capacity 0–25, 0–50, 0–100, 0–200, 0–500

MILLIAMETER, DC — Capacity 0–1, 0–5, 0–10, 0–25, 0–50, 0–100, 0–200, 0–300, 0–500, 0–1000

OSCILLOSCOPE — 5 or 7 in. screen, direct coupled, push-pull vertical and horizontal amplifier, variable sweep, 15, 30,000 Cps or 3, 30,000 Cps, 105–120 v., 50–60 cycle a.c.

OVEN, ELECTRIC — 225° F. at 1000 watts, motor driven, forced air ventilation, 30 by 25 by 24 in., 110 v., single phase 50–60 cycle a.c.

POT, SOLDERING, ELECTRIC — Capacity 2 lb., 150 watt, 300 watt or 600 watt, 110–120 volt, a.c.–d.c.

PROBES, HIGH VOLTAGE — Capacity up to 50 KV–DC with phone tips and coaxial connectors

SCREWPLATE — 4–36, 6–32, 8–32, 10–24, 10–32, 12–24 machine screw standard, ¼–20, 5/16–18, ⅜–16, 7/16–14, ½–13 NC, ¼–28, 5/16–24, ⅜–24, 7/16–20, ½–20 NF

SELENIUM TESTER — Variable voltage, 25–300 volts a.c., capacity 20–650 ma

SQUARING, SHEAR — 24, 30, or 36 in., foot operated, capacity 18 gauge

TEST EQUIPMENT, STANDS — 18 by 24 by 34 in. high, with wheels, wooden tops

TUBE, TESTER — Direct reading, reproducing simulated operating conditions, 0–3000–6000–15,000 microhms, 110 v.–130 v., 50–60 cycle, a.c.

TRACER — R.F., I.F, and audio signals tracer, minimum speaker 5 in., equipped with jack for connection with voltometer, provides visual measurements, 105–125 volts, 50–60 cycle, a.c.

VISE, JEWELERS' BENCH — 2½ or 3½ in. jaws, swivel or stationary, solid or removable jaws

VOLT (A.C.)–AMMETER — Capacity 0–25, 0–50, 0–100 amperes

VOLTAGE CONTROL — Variation type, voltage 0–130, 0–230 watts, 2 amp., operation on 110–120 v., 50–60 cycles a.c., or 150–300 watt, 65, 75, 90, 100, 115, 130, 145 volts (50–60 cycles)

VOLTOHMYST — 105–125 v., 60 cycle a.c., 7 ranges d.c.–a.c., 30 cps to 3 mc

VOLTOMETER — Calibrated for volts, ohms, milliameters, a.c.–d.c. ranges 0–10–50–250, 1000, 5000, with test leads

WELDER, ELECTRIC SPOT — 3KVA–200 volts-single phase

Radio–Television Electronics — Small Tools

AUGER BITS — ¼, 5/16, ⅜, 7/16, and ½ in.

AWL — Scratch 6 in.

BATTERY HYDROMETER

BENDER, TUBING 10½ in. — ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.

BLOW TORCH
1. Gasoline ¾ pt.
2. Alcohol ¾ pt.
3. Gasoline pump, heavy duty

BRACE — Carpenters', 8 in. sweep

CARD — Patch, 2, 3, 5 ft.

CLAMPS — "C," small

CLIPS
1. Alligator, fit banana plugs 2 in.
2. Alligator, insulated, black handle, 2 11/32 in., red handle, 2 11/32 in.
3. Battery lead plates, 25 ampere, 2⅞ in., 50 ampere, 4 in., 100 ampere, 6 in.
4. Copper, solid, 50 ampere, 2⅞ in., 100 ampere, 4½ in., 200 ampere, 6 in., 300 ampere, 7¾ in.
5. Crocodile, screw connection 2⅛ in., tip clip 2⅝ in.
6. Flexible
7. Non-ferrous R.F. 1 11/16 in.
8. Snapper, 7 in.
9. Teeth, mesh, 3-sided, 20 ampere, 2 7/16 in., 40 ampere, 2 7/16 in.
10. Test, mesh teeth, 5 ampere, 1½ in., 10 ampere, 1½ in., 10 ampere, 2 in., 10 ampere, 2¾ in.
11. Twin, double end 2 in.

COUNTERSINK — 82° angle, ¼ in. shank, H.S. steel

CUTTERS
1. Hole, adjustable ⅞–4 in., 1–3½ in.
2. Hole extension 1½–8 in.
3. Tubing, capacity 1 in.

DIVIDERS — Wing 6 or 8 in.

DRILLS — Set, fractional, numbered
1. Steel, numbered 1–60
2. Steel, fractional 1/16–½ in.

DRILLS
1. Breast, ¼ in. chuck, 2 speed type
2. Hand, ¼ in. chuck 2 speed type

DRILLS, ELECTRIC
1. Portable, ¼ in. capacity
2. Portable, ½ in. capacity

FILES
1. Flat, fine, 8 and 10 in.
2. Flat, coarse, 8 and 10 in.
3. Half round, 6, 8, and 10 in. double cut
4. Rat-tail, ½ in. diameter, 6, 8, and 10 in., single cut
5. Round, 8 and 10 in., single cut and double cut
6. Triangular 6, 8, and 10 in., double cut

GAUGE
1. Tap and drill, 1–60, ¼/28 to No. 2/56
2. Drill point, graduated to 1/32 in.

GUN — Soldering, Electric
1. Single heat, 135 watts, 110–120 v., 60 cycle, a.c.; 250

watts, 110–120 v., 60 cycle, a.c.
2. Dual heat, 100–150 watts, 110–120 v., 60 cycle, a.c.; 200–275 watts, 110–120 v., 60 cycle, a.c.

HAMMER
1. Ball peen, 2, 4, 8, and 12 oz.
2. Cellulose, ½ lb.

INSPECTION MIRROR
1. Radio chassis
2. Television

IRONS — Soldering, electric
1. 35 watt, 110–120 v., a.c.-d.c.
2. 40–60 watt, 110–120 v., a.c.-d.c.
3. 80 watt, 110–120 v., a.c.-d.c.
4. 100 watt, 110–120 v., a.c.-d.c.
5. 125 watt, 110–120 v., a.c.-d.c.
6. 200 watt, 110–120 v., a.c.-d.c.
7. 300 watt, 110–120 v., a.c.-d.c.
8. Pencil type
9. Pistol type
10. Miniature type
11. Angle type
12. General purpose type

LEADS, TEST
1. High voltage, 10,000 v., 15,000 v.
2. Needle point
3. Pencil prod, 5, 8 in
4. Slim line
5. Tenite, heavy duty

PLANE — Carpenters', 8, 12 in.

PLIERS
1. Angle nose, gripping, 7 in.
2. Assembly, 8 in.
3. Chain nose, 4½ in.
4. Channel-lock, 10 in.
5. Combination, 6 in.
6. Curved needle nose, 6 in.
7. Diagonal, 5, 6, or 7 in.
8. End cutting, 7 in.
9. Insulation skinning, 6 in.
10. Long flat nose, 6 in.
11. Needle nose, 6 in.
12. Non-magnetic, 6½ in.
13. Plastic cutting, 6 in.
14. Round nose, 4½ in.
15. Side cutting, 6 or 7 in.
16. Terminal installation, 7½ in.

PULLERS, TUBE
1. Miniature tubes
2. Standard tubes

PUNCHES
1. ⅛, 5/64, 3/32, 1, 1 1/16, 1 1/8, 1 5/32, 1 5/16, 1 1/4, 1 3/8, 1 1/2, 2 1/4
2. Key, 1 5/16, 1 17/64, 1 11/64, and 1 21/64 in.
3. "D" Type, ½ in.
4. Square, 5/64, 3/32, 1, 1 1/16, 7/8 in.

REAMER, TAPERED — ⅛ and ½ in. by 5½ in.

RULE
1. Folding, 6 in.
2. Steel, 12 in.

SAWS
1. Crosscut
2. Hack, 10 and 12 in. blades
3. Keyhole, 7½ in.
4. Stickleback, ¼ by 7 in.

SCREWDRIVERS
1. 4 and 5 in. by ⅛ in. blade
2. 6 and 7 in. by ¼ in. blade
3. Duplex, 7 in.
4. Insulated, 9 in.
5. Long shank, with screw holding clips
6. Phillips, No. 4, 5, 9, 10, and 16
7. Regular, 4½ and 8¼ in.
8. Set, 5 and 6 in.
9. Set blades, .100, .080, .070, .055, and .040 in.
10. Set, jewelers', blades, .1, .08, .07, .055, .040, and .025 in.
11. Flexible shaft 7¼ by 7/32 in. tip
12. Offset, Phillips, Nos. 1 to 9; and standard
13. Magnetic, blade, 2½, 4 and 5½ in.
14. Ratchet, 12⅝ in. closed

SCRIBER — 9 in.

SNIPS
1. Line, 7 by 1⅝ in. cut
2. Aviation, right hand, 10½ by 1¾ in. cut; left hand, 10½ by 1¾ cut

SOCKETS
1. Flex-drive, 3/16, ¼, 5/16, ⅜, 7/16, and ½ in.
2. Midget, 3/16, ¼, 5/16, ⅜, 7/16, 11/32, and ½ in. with ¼ in. drive and T-handles, ratchets and universal
3. Spin-tite, 3/16, ¼, 5/16, 11/32, ⅜, 7/16, and ½ in.
4. Flexible drive, 3/16, ¼, 5/16, ⅜, 7/16, and ½ in.

STRIPPERS, WIRE — Capacity No. 30 to No. 8 wire

TACKER, STAPLING — 300 ohm cable

TERMINATED TOOL — 7½ in. wire sizes No. 22 to No. 10

TOOLS, ALIGNMENT
1. Aligners: slim, dual, hex-square, nib, stub
2. All purpose
3. Nylon, molded, TV–FM
4. Tuner, TV channel
5. Wand tuning

TROUBLE LAMP — 105–125 v., a.c.

WRENCHES
1. Adjustable, crescent, 4, 6, 8, 10, and 12 in.
2. Allen screw Nos. 4, 5, 6, 8, 10, also ¼ and 5/16 in.
3. Box, ¼, 5/16, ⅜, 7/16, ½, 9/16, 5/8, and ¾ in.
4. Bristol, No. 2 to ⅜ in.
5. Capacitor mounting
6. Nutdriver, ¼ in. amber handle 6 in.; 5/16 in. amber handle 9 in.; ⅜ in. blue handle 6 in.; 5/16 in. yellow handle 6 in.; 5/16 in. black handle 6 in., 7/32 in. brown handle, 6 in.; ¼ in. red handle 6 in.; 7/16 in. amber handle 7 in.; 11/32 in. green handle 6 in.
7. Open end, 5/16, ⅜, 15/32, 7/16, ½, 9/16, and 19/32 in.
8. Ring, spin-tite

Radio — Television Electronics — Supplies

ALUMINUM — 20, 18, and 16 ga. sheets

ANGLE, BRASS — ½ by ½ by 1/16 in.

BATTERIES, PORTABLE
1. "A", 1½, 4½, 6, 7½ volts
2. "B", 45, 67½, 75, 103½, 300 volts

BEARINGS, PANEL

BLADES, HACKSAW — 10 and 12 in., 24T

SAL AMMONIAC, BLOCKS — 1 lb.

BRAID, SHIELDING — I.D. ⅛, 11/64, 3/16, ¼, and 25/32 in.

CARBON TETRACHLORIDE

CEMENT — coil, plaster, radio, rubber, speaker cone, vinylite

FUSES
1. 3 AG, 250 v. 1/16 amp. to 8 amp.
2. 3 AG, 32 v. 5 amp. to 30 amp.
3. 8 AG, 1/500 amp. to 5 amp.
4. 3 AG, TV pigtail, ¼ amp. 125 v.; ¼ amp. 250 v.
5. AG, TV pigtail, ¼ amp, 3/8 amp, 250 v.

FUSE PLUGS — 15, 20, 25, and 30 amp.

GREASE
1. Self-lubricating
2. Semi-solid
3. Short fiber

GROMMETS, RUBBER — ¼, 5/16, 3/8, ½, and 5/8 in.

LACQUER
1. Crystallizing
2. Insulating

LAMPS, MINIATURE — Volts
1.1, 1.3, 1.9, 2.0, 2.2, 2.3, 2.4, 2.5, 2.7, 2.15, 3.2, 3.6, 3.8, 6.0, 6.2, 6–8, 18, 28

LUGS — Solder, No. 8 and No. 10

MASONITE — Ripple finish, ⅛ in. smooth

MATERIALS — Crackle finish (Kem Art metal finish, tri-seal)

MACHINE OIL — SAE 10–20

NUTS — Steel, hexagon head
1. Acorn, self locking, 6–32 by ¼ in., 8–32 by ¼ in., 10–32 by 3/16 in.
2. Speed, self locking, 4–36 by ¼ in., 6–32 by 5/16 in; 8–32 by 5/16 in.

PAINT — Luminous (non-poisonous), shielding

PASTE — Solder

POST, BINDING — Bakelite-brass
1. Single, hole 3/32 in., screw 6–32 by ½ in.
2. Twin, hole 3/32 in., screw 6–32 by ¼ in.
3. Triple, hole 3/32 in, screw 6–32 by ¼ in.

QUARTS — 3 by 8 by .1 in.

ROD — Brass, ¼ in, round, and brass, ¼ in. square

SCRAPS — Bakelite and hard rubber

SCREWS
1. Brass, machine, flat head with nuts, 4–36, 6–32, 8–32, lengths of ¼ to 1½ in.; round head with nuts, 4–36, 6–32, 8–32, lengths of ¼ to 1½ in.
2. Ornamental head, 6–32, 8–32
3. Steel, binding head, machine, 6–32 by ¼ in., 6–32 by ⅜ in., 6–32 by 5/16 in., 6–32 by ½ in., 8–32 by 5/16 in., 8–32 by 3/8 in., 8–32 by ½ in.
4. Steel, phillips head, 6–32 by ¼, ½, and ¾ in.; 8–32 by 5/16, ½, and 1 in.
5. Steel, round head, 4–32 by ¼ in., 4–36 by ½, and ¾ in., 6–32 by ¼, ½, ¾, 1, and 1¼ in., 8–32 by ¼, ⅜, ½, ¾, and 1 in., 10–32 by ½, ¾, and 1 in.
6. Steel, self-tapping, flat-slotted, hex. head, 4 by ½, 6 by ¼, and ½ in., 8 by ½, and 1 in., 10 by ½ in.

SOLDER — 40–60 multicore, 50–50 non-corrode

SOLUTIONS, LYE

SOLVENT, CEMENT

SPRINGS, DIAL DRIVE — Assorted sizes

STAPLES, INSULATED — 5/8 in.

STEEL — Sheet, galvanized, 1/16 in.

STOCK — Sheet, amphenol polystyrene

STRIPS
1. Brass (half-hard) ½ by 1/16 in.
2. Wiring, terminal-lug

TAPE
1. Plastic label, 7/16, ½, 5/8, ¾, 1, 1½, and 2 in. widths black, blue, red, green
2. Radio friction, ⅔ in. width
3. Insulation, plastic backing, ¼ in., 10KV, 200,000 megohms

TERMINALS
1. Ring, 4/6, 8/10
2. Spade, 4/6, 8/10

THINNER, CEMENT

TUBING
1. Bakelite, OD 1, 1½, 2, 2½, 3, and 3½ in.
2. Polystrene OD ¼, 5/16, ⅜, ½, 5/8, ¾, 1, 1½, and 2 in.
3. Insulating, varnished cambric, I.D. .034, .042, .053, .066, .083, and .106 in.

VARNISH — Insulating. Wrinkle

WASHERS
1. Cup, Nos. 6, 8, and 10
2. Fiber, Nos. 6, and 10
3. Lock
4. Plain
5. Split, Nos. 6, 8, and 10
6. Star, internal, Nos. 6, 8, and 10

WIRE
1. Cellulose braid lacquered
   20 AWG solid
   20 AWG 10 by 30 stranded
   18 AWG solid
   18 AWG 16 by 30 stranded
   Red, black, blue, green, yellow, orange, white, brown
2. Thermoplastic insulated
   22 AWG solid
   20 AWG solid
   22 AWG 7 by 30 stranded
   20 AWG 10 by 30 stranded
   18 AWG 16 by 30 stranded
   Black, brown, red, orange, yellow, green, blue, violet, gray, white
3. Rubber insulated push back, 20 AWG 10 by 30 stranded
4. Magnet, plain enameled, size: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, and 40
5. Magnet, single cotton enameled, size: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, and 40
6. Aerial No. 25 stranded
7. TV lead in, 300 ohm, 150 ohm

Ceramics Shop Equipment, Tools, and Supplies

E. W. CARLS
Vocational Instructor
Department of Corrections
Chino, Calif.

KICK WHEEL — 27 by 20 in. worktable, regulated speed

KILN, ELECTRIC — 18 by 18 by 18 in. firing chamber, 220–230 volt, top opening, floor model

KILN, ELECTRIC — 15 by 21 by 18 in. firing chamber, 220–230 volt, single phase with pyrometer and automatic cut-off, with storage cabinet opening at front

MILL, BALL — ⅛ h.p. motor drive, 110 volt, 60 cycle, a.c., millspeed 60–70 r.p.m.

MIXER, PORTABLE — ¼ h.p. motor, propeller size 3 in., shaft ½ in. dia. and 30 in. long

POTTERS WHEEL — Floor model, ¼ h.p. motor, 110–115 a.c., single phase, equipped with throwing head

SCALE, POTTERY — Capacity 2616 grams (6 lbs.) with extra weights

SPRAYER — ¼ h.p. motor, compressor, internal mixer and spray gun with air hose

WEDGING BOARD — 22 in. wide, 14¼ in. deep and 14 in. high, wood and plaster construction

WORK BENCH — 34 in. height, 24 in. deep, 12 ft. length (minimum). Equipped with storage cabinets below

Ceramic Shop, Hand and Other Small Tools

BRUSHES
1. Flat type ox hair, size ⅛, ¼, ⅜, and ¾ in.
2. Red sable, fine, sizes 00, 0, 1, 2, 3, 4, 5, 6, hair length 5/16 to 19/32 in.
3. Stencil, white bristle, tin ferrule, wood handle, 2, 3, 5, 6, and 8

CONES, PYROMETRIC — Nos. 002 down to 01 by units and No. 1 to No. 10. Range in fahrenheit from 1121 to 2786 deg.

CYLINDER — Graduated glass, blue line, with enlarged base, 200 ml. capacity

FETTLING KNIVES

MODELING TOOLS
1. 5, 6, and 8 in. length, set of 16 assorted all wood and wood and metal
2. Lace, stainless steel, set of 6 assorted

MODELING WHEELS — Non-corrosive head, ball bearing, 8 in. head

MORTARS — Porcelain, colors, sizes No. 4 and No. 8, with pestles

PANS, MIXING — Aluminum, 6 compartment 5½ by 3¾ in.

SGRARRITO TOOLS — Set of six assorted

RESPIRATORS — Cellulose filter type, approved by U. S. Bureau of Mines

RESPIRATOR, REFILLS

SHELF SUPPORTS — 1 by 1 by 1 in., 1 by 1 by 3 in., 1 by 1 by 4 in., 1 by 1 by 8 in.

SHELVES — ½ by 10 by 14 in. silicon and 16 by 16 by ½ in. refractory

SIEVES — Metal frame 8 in. diam., 2¾ in. high, 1¾ in. depth to brass cloth, complete with pans and lids, 80, 100, 150, 200, and 300 mesh

SLIP TRACER — Rubber bulb, 1½ oz. capacity

SPATULAS — Stainless steel, wood handle, 3½, 4½, and 5½ in.

SPURS — 3/16 in. high, 3/16 in. point to point

STILTS
1. Star type, ¼, 1, and 1½ in. (4 point)
2. Double pointed (3 points), Nos. 1 to 12

THROWING HEADS — Aluminum, heavy

TONGS, DIPPING — Rust proof plating, set of 3, 90°, 45°, and straight

TRIANGLES — Nos. 1 to 4

TURNING TOOLS
1. Half moon, right and left, 9 in. length approx.
2. Triangle, 9 in. length aprox.

Ceramics Shop Supplies

ACETONE — Brush cleaner
APPLICATION MEDIA
BALSAM OF COPAIBA
BENZOL — Diluting and brush washing
BONE ASH — Dust, 200 mesh.
CLAY
1. Modeling, prepared
2. Modeling, dry
3. Slip casting, white, dry
4. Ball, 200 mesh
5. Bentonite
6. Jordan — dual purpose
7. China or Kaolin

CORNWALL STONE — For warp prevention

ENGOBES — Assorted colors

FELDSPAR — Potash or soda

FRENCH FAT OIL

FRIT — Borosilicate, leadless, lead frit, high soda

GLASS, GROUND

GLAZE
1. Majolica, low fire
2. Transparent, crackle
3. Matt, crystalline

GROG
1. 150 mesh microsil
2. 6, 20, and 40 mesh

HYDROCAL

MOLDS — Ready made

MOLD MATERIAL — Rubber latex

NEPHELINE SYENITE

OIL OF COPAIBA

OIL OF LAVENDER

OVERGLAZE
1. Prepared and dry
2. Metallic
3. Luster

POTTERS PLASTER

SOAP — Mold separating

SODIUM CARBONATE — 10 per cent solution

SODIUM SILICATE — 40 per cent solution

TALC — Ceramic, 200 mesh

TETRASODIUM PYRO-PHOSPHATE

TURPENTINE

UNDERGLAZE — prepared

Lapidary Shop, Equipment, Tools, and Supplies

E. W. CARLS
Vocational Instructor
Department of Corrections
Chino, Calif.

BENCH
BUFFING AND POLISHING UNIT

DRILL — Lapidary
FACETING HEAD OR UNIT
GRINDING UNIT

LAPPING UNIT
SANDING UNIT
1. Disk
2. Drum

SLABBING SAW
TRIM SAW

Small Tools and Equipment

ANVIL — Bench
BLADES — Jewelers' saw
BUNSEN BURNER
BLOW PIPE
BLOW TORCH
BRUSHES — Borax
CALIPERS — Vernier
DAPPING PUNCHES — Set

DAPPING DIE
DAPPING BLOCK — Lead
DIVIDERS, WING — 8 in.
DOP STICKS — Assorted, wood
DOPS — Metal
DRILL — Hand, ¼ in. capacity, 12 in. overall
DRILL TUBES — 13, 14, and 17 gauge

DRILLS — Carbon steel-set, 1/16 to ¼ in. by 32nds
FILES, JEWELER'S
1. Hand, flat, 4, 6, and 8 in.
2. Half round, 4, 6, and 8 in.
3. Round, 4, 6, and 8 in.
4. Ring, 6 in.
5. 3-cornered, 6 and 8 in.
6. Swiss pattern needle-set of 12, 5½ in. assorted

GAUGE — Sheet metal
HAMMERS
1. Ball peen, 2 oz. and 4 oz.
2. Chasing, 1¼ in. face-number 2
3. Peening and staking, 8½ in.
4. Plastic
5. Rawhide (mallet) 6 oz. and 10 oz.
6. Planishing

LAPS
1. Iron or steel
2. Tin
3. Copper
4. Lucite
5. Aluminum
6. Type metal

PLIERS
1. Chain nose, 4½ in.
2. Half round nose, 5 in.
3. Forming, 4½ in.
4. Needle nose, 6 in.
5. Flat nose, 4½ in.
6. Diagonal cutters, 6 in.
7. End nippers, 5 in.

POLISHER — Leather
1. Felt sheel
2. Cloth buff

RING HOLDER
RING MANDREL
SANDER
1. Hollow head
2. Plain head
3. Drum

SAW BLADES — Diamond bonded
SAW FRAME — Jewelers, adjustable to 3 in. throat
SCREWDRIVER
1. 8 in.
2. Jewelers

SCRIBER — Awl type, 5½ in.
STONE PUSHER
TEMPLATE — Cabochon type
1. 20°
2. 30°
3. 45°
4. 60°

TEMPLATE — Stone gauge
TEMPLATE — Gem type
TIN SNIPS — 7, 10, and 12 in.
1. Straight
2. Circle cutting

TWEEZERS
1. General purpose
2. Soldering
3. Gem, spring type

Supplies

ABRASIVE
1. Cloth, emery, 200; 300, 4/0, 5/0, 6/0, 7/0, 8/0, 10/0; 400; garnet, 200; 300; 4/0, 5/0, 6/0, 7/0, 8/0, 10/0; 400
2. Crocus cloth
3. Grit
4. Paper, silicon carbide, assorted grits
   a. Emery (corundum)
   b. Diamond bort
5. Scotch stone, ¼ by 5 in. sticks

CEMENT
COOLANT
CUTTING COMPOUND
FLUX
HARDNESS SET — Mohs' scale
LACQUER — Metal, 4 oz. bottles
POLISHING COMPOUND
1. Cerium oxide
2. Diamond dust, 3200 and 6400 mesh
3. Rouge, jewelers
4. Tripoli

ROCK — Slabs or rough material
SOLDER — Silver
1. Clipped
2. Wire type

SPONGES
STEEL WOOL — Pads, No. 00, No. 000, No. 0000
STONE — For setting cabochons

Leathercraft, Tools, and Supplies

E. W. CARLS
Vocational Instructor
Department of Corrections
Chino, Calif.

Leathercraft, Tools

BOARD, MAPLE — Cutting ¾ by 7¾ by 10¾ in. or larger
CREASER, METAL EDGE — Sizes 1, 2, 3, 4, and 5
EDGE BEVELER
EDGE TOOL
EMBOSSING CARRIAGE — Complete with set of wheels
EXTENSION BLADES
1. No. 2 bevel
2. No. 1 lance point
3. No. 0 sharp point
4. No. 00 curve point

EXTENSION BLADE HANDLE — Patented, plastic, unbreakable
EYELET SETTER
FID OR BELT AWL — 2¼ in. blade
FINISHING WHEEL
FOLDER, BONE — 6 in.
GAUGE, DRAW — Length of slide 4 in., with extra blades
HAMMER — Shoe or cobblers, 12 oz. No. 00
KNIFE
1. Incising, beveled blade
2. Square point, blade 4 in. long and 1 in. wide
3. Round, 5 in. blade
4. Head, 4½ in. blade
5. Skiving, bevel point
6. Swivel top cutter, with extra blade

MALLET, WOOD — Preferably lignum vitae
MODELING TOOLS — Rubber handle, stainless steel, in several patterns including, pointed, flat, deer foot, ball end, diamond point, and combination point
NEEDLES, LACING
PLIERS, LACING — 5¼ in. single joint
PRICKING WHEEL
PUNCH
1. Revolving head, tube sizes 1, 2, 3, 4, 5, and 7
2. Revolving head, tube sizes 2, 4, 6, 7, 8, and 10
3. Drive, sizes 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9

RIVETER, PATENTED — For tubular or split rivets
SHEARS, LEATHER — 8 and 12 in.
SKIVER, PATENTED TYPE — Complete with extrta blades
SNAP FASTENER SET — Beginners set, 4 in. flat anvil, 2 bodkins
SPACE MARKER — 5, 6, or 7 spaces per inch
SQUARE, STEEL — 12 in. blade, 7 in. tongue, 1 in. width
STAMPS — Wide variety needed
STIPPLER — Background
THONGING CHISELS
TRACER — For design tracing

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1. Waterproof, flexible type, all purpose
2. Rubber

DYE — Leather, assorted colors, liquid and powder
HARNESS WAX
HANDSEWING WAX
OIL, NEATSFOOT
RIVETS
1. Tubular
2. Split
3. Rapid (Rivet and cap type)

SADDLE SOAP
SNAP FASTENERS
1. Button
2. Socket stud
3. Eyelet type

MATHEMATICAL METHOD FOR LAYING OUT SHEET-METAL PIPES

THOMAS A. SHOTWELL
Benson Polytechnic High School
Portland, Ore.

The increasing cost and scarcity of steel, especially stainless steel, have led to a re-examination of methods for avoiding waste or reversion to scrap. Many shops have not sought accurate methods for producing large steel pipe joints when at unusual angles not included in their stock of templates on hand or easily obtained. They have instead been satisfied to write off some extra wastage on odd angle jobs where partly cut-and-tried methods were used in the past.

Layout methods convenient for pipes of small size are likely to be awkward and inconvenient when the pipe involved is of large, say 40-in. dia. This is especially true when the shop is fabricating pipe turns only and therefore cannot spread wastage losses over a considerable amount of construction containing mostly straight lengths.

This article presents a method for making pipe angles by marking a sufficient number of points directly on either pipe cylinders or flat steel. And this for any size pipe and for any angle, and without involved mathematical procedure or drawing equipment. It also includes complete derivation of all data used.

Figure 1 is a layout which illustrates the usual *development of a cylinder* such as may be found in any drawing or layout text. This development provides a method for laying out on flat material the curve required if the end of a cylindrical pipe is to have some angle other than 90 degrees or a square cut. The base line must be equal to the circumference of the cylinder and represents 360 deg. The curve goes up to a maximum at 180 deg. and then falls off in the inverse of the way that it rose.

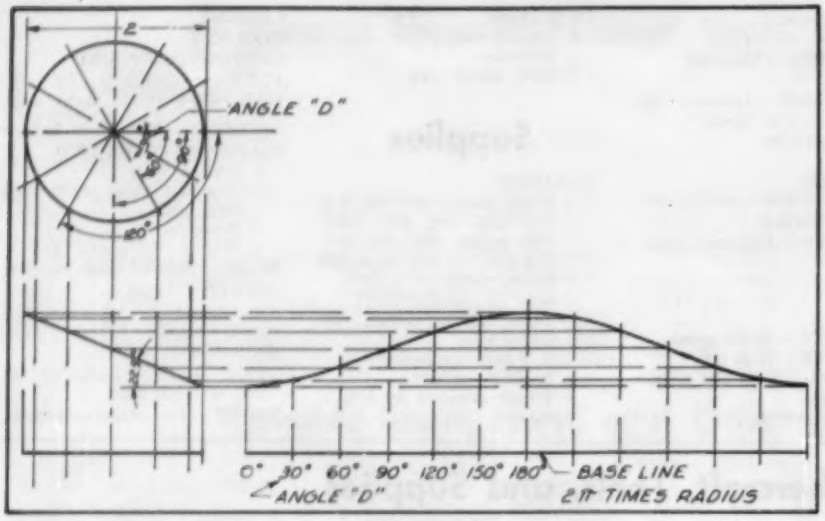


Fig. 1. Actual layout of cylinder

How to obtain the same, or better, results without the use of the *development* is shown in the accompanying table. Much of the table given is not needed at all for the layout but is merely inserted to show interested persons how the essential parts are obtained. Specifically, columns: (1), (2), (3), and (4) can be used for any pipe angle and any pipe size and will always be the same. The table includes only half of the curve. If the other half, from 180 degrees to 360 degrees, is not conveniently laid out from the first half — it may be plotted independently from the same point data. Simply use the same data and measure X distances from the right end of the base line instead of from the left end. P, the angle to be obtained at the pipe end, will obviously be the same angle for each of two pipes that join. Thus, if only one joint is made in making a turn in the pipe, P is half the total turn angle. If a small symmetrical section is inserted all four angles will be equal and each equal to one fourth of the total angle of the turn.

If it is convenient to divide the base line into 36 equal parts by some other method, then none of the data in columns one to five will need to be used.

Explanation of the Data in the Table

Column (1): The development angles selected for use here are purely arbitrary. Any desired number of points could be obtained (instead of the 36 this table provides) by simply using more or less divisions along the base line or around the pipe. For example: 1°, 2°, 3°, etc., would provide 360 points; and 30°, 60°, 90°, etc. would provide 12 points.

Column (2): Values in this column are the respective cosines of the development angles obtained from tables of natural functions. It should be noted that cosines in the second and third quadrants are negative.

Column (3): Tables do not give these numbers directly, but the numbers are obtained by subtracting the respective cosines from one. Subtracting negative values of cosines (for angles beyond 90°) adds their numerical values.

Column (4): Actually these numbers are the equivalents in radians for the angles given in degree units in column (1); and they are only furnished as a convenient means of dividing the base line into 36 equal parts.

Column (5): To obtain these numbers, which are divisions of the base line measured from the left end, *the number in column (4) is multiplied by the pipe radius* (half the diameter). Each number gives the total distance from the starting point, and provides a point along the base line from which the vertical distances of column (6) are to be measured to determine points on the curve.

Column (6): This column gives the vertical heights of the points on the curve measured from the respective X points on the base line. Numbers in column (6) are obtained by multiplying the *number from column (3) times the radius of the pipe times the tangent of the angle the end of the pipe is to have.* The tangent is obtained from a table of natural functions.

Practical Procedure

a) Lay off a base line equal to the circumference of the pipe.

b) Divide this line into 36 equal parts, either by using column (4) and the radius or by some other convenient method.

c) Find the numbers for column (6), and measure corresponding distances consecutively above the base line on the points found in (*b*). This will provide the points for the left half of the curve.

d) Start from the right end of the base

(Continued on page 19A)

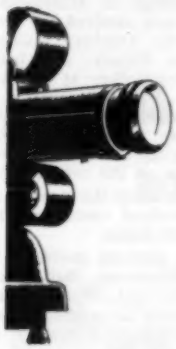
Table of Data Used for Developing Pattern

(1) D	(2) Cos D	(3) 1 — Cos D	(4) $\frac{\pi D}{180°}$	(5) (4) × r = X	(6) (3) × r × tan P = Y
0°	1.0000	0.0000	0.0000	0.0000	0.0000
10°	0.9848	0.0152	0.1745	1.745	0.063
20°	0.9397	0.0603	0.3491	3.491	0.250
30°	0.8660	0.1340	0.5236	5.236	0.555
40°	0.7660	0.2340	0.6981	6.981	0.969
50°	0.6428	0.3572	0.8727	8.727	1.480
60°	0.5000	0.5000	1.0472	10.472	2.071
70°	0.3420	0.6580	1.2217	12.217	2.725
80°	0.1737	0.8263	1.3963	13.963	3.423
90°	0.0000	1.0000	1.5708	15.708	4.142
100°	−0.1737	1.1736	1.7453	17.453	4.861
110°	−0.3420	1.3420	1.9199	19.199	5.558
120°	−0.5000	1.5000	2.0944	20.944	6.213
130°	−0.6428	1.6428	2.2689	22.689	6.743
140°	−0.7660	1.7660	2.4435	24.435	7.315
150°	−0.8660	1.8660	2.6180	26.180	7.729
160°	−0.9397	1.9397	2.7925	27.925	8.034
170°	−0.9848	1.9848	2.9671	29.671	8.221
180°	−1.0000	2.0000	3.1416	31.416	8.284

In the table above, columns (1), (2), (3), and (4) are the same for any pipe at any angle provided the base line development angles in (1) are chosen the same. Columns (5) and (6) illustrate how the tables are used to determine co-ordinates (X and Y) if the pipe is 20 inches in diameter and the actual angle at the end of the pipe is 22.5 degrees. Tan 22.5° equals 0.4142.

References: "A Manual of Mathematics," Hudson and Lipka.
"Engineering Drawing," French.

STANLEY SHOP TALK



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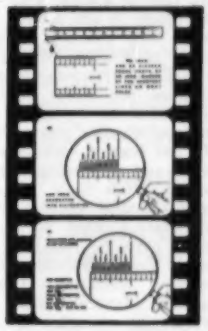

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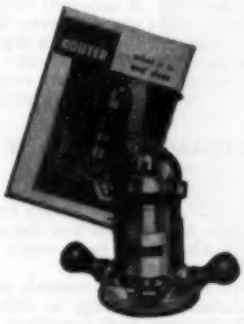

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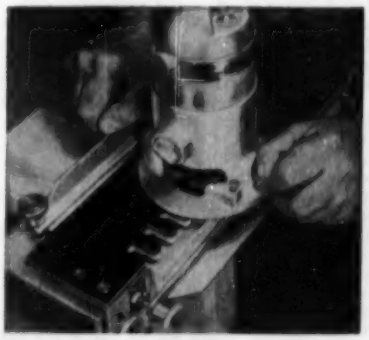

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Personal News

DR. EWING OF HAWAII VISITING PROFESSOR AT WESTERN MICHIGAN COLLEGE THIS SUMMER

Dr. Claude Ewing, who is no stranger to many people in and around Michigan and the Chicago area, will be a visiting professor this summer at Western Michigan College, Kalamazoo. Dr. Ewing was director of the Chicago Vocational School for many years. Previous to that time he served as supervisor of the Vocational Curriculum.

He has been a visiting professor at many colleges and universities, including the Stout Institute, Utah State College, Purdue University, Northwestern University, and Colorado State College.

Since 1950, he has been in the Hawaiian Islands. From 1950–53 he was director of vocational education at the Kamehameha Schools in Honolulu. Since 1953, he has been professor of education at the University of Hawaii and teacher trainer in Trade and Industrial Education for the Territory of Hawaii.

Dr. Ewing is well known as author of several important publications in the area of industrial education. Among his books are "Practical Instruction for Paper Hanging," "Materials and Methods for Vocational Training," "General Mathematics at Work," and "Tested Training Techniques." He is also an educational advisor for Prentice Hall, Inc.

He will teach classes in Trends in Industrial Education and Curriculum Construction at Western.

Dr. Ewing is the first of the visiting professors to be on Western Michigan College's campus for an expanding graduate program in industrial education.

DR. DE WITT HUNT APPOINTED SPECIALIST FOR INDUSTRIAL ARTS

Dr. DeWitt T. Hunt of Stillwater, Okla., has been appointed to serve as Specialist for industrial arts on the staff of the Office of Education.

Dr. Hunt, on leave of absence for one year as head of the School of Industrial Arts Education and Engineering Shopwork at the Oklahoma A. & M. College, succeeds John R. Ludington in this position. Dr. Ludington was recently named the director of a newly initiated Civil Defense Education Project being conducted by the Office of Education.

Dr. Hunt for the past 15 years has served as chairman of a State Advisory Committee for industrial arts in Oklahoma Schools. He is editor of "The Industrial Arts Teacher," is past president of the American Industrial Arts Association, chairman of the Oklahoma A. & M. College Safety Committee, and a member of the Evaluation Committee, School Shop Safety, for the National Safety Council. He is the author of several books in the industrial arts field, a contributor to the industrial arts and vocational education press, and an active participant in State and national education convention programs.

Dr. Hunt began his teaching career in Taylor (Texas) High School in 1908. Later he taught shopwork in the Fort Worth public schools. Since 1915 he has held positions at Oklahoma A. & M. College. In administering the School of Industrial Arts Education and Engineering Shopwork at Oklahoma A. & M. College, Dr. Hunt directs the planning of curriculum for 4-year degree courses, supervises teachers, prepares teaching assignments, and teaches both undergraduate and graduate courses. He holds B.S. and B.M.T. degrees from Valparaiso University, a B.S. degree in education from Oklahoma A. & M. College, and M.A. and Ph.D. degrees from Ohio State University.

He is a member of the National Education Association, the American Industrial Arts Association, Oklahoma Industrial Arts Association, American Vocational Association, American Society for Engineering Education, Oklahoma Education Association, and Mississippi Valley Industrial Arts Conference.

Dr. Hunt entered upon his new duties in the Office of Education on January 27.

♦ Prof. Lynn A. Emerson, well-known authority in industrial education, has retired from the nine-year-old New York State School of Industrial and Labor Relations at Cornell University.

Prof. Emerson has accepted an appointment as Vocational Educational Consultant on Project Israel of the Research Foundation of the University of the State of New York, effective March 31. The Foundation has a contract with the Foreign Operations Administration.

Prof. and Mrs. Emerson will fly to Israel in March where he will assist the Israeli government and private groups in establishing and improving vocational schools and teacher training methods.

♦ Dr. James A. Krumhansl, formerly associate professor of physics at Cornell University, has joined the staff of the Research Laboratories of National Carbon Company, a division of Union Carbide and Carbon Corporation, as assistant director of research. He will be located in Cleveland at National Carbon's new Research Center, now under construction.

♦ Lewis H. Hodges, a member of the Grand Haven high school faculty since 1937, has joined the University of Michigan faculty as a lecturer in the School of Education and the Extension Service.

♦ Recent doctoral graduates from Cornell University are as follows: Dr. Daniel J. Paolucci, who is training officer for the Panama Canal Company; Dr. Joseph E. Milano. Dr. Milano is handling training with the Turbine Division of General Electric Co., Schenectady, N. Y.; Dr. H. LeRoy Marlow, who is in the training department of Koppers Company in Pittsburgh; Dr. Herbert G. Zollitsch, who is on the staff of School of Business Administration, Marquette University, Milwaukee, Wis., and is participating in management development programs; and Dr. Burr D. Coe, the director of Middlesex County Vocational Schools, New Brunswick.

♦ Donald G. Lux, formerly instructor, department of education, Ohio State University, Columbus, Ohio, has been appointed assistant professor, Industrial Education, University of Illinois, Urbana, Ill.

♦ Dr. George P. Borglum, chairman of the French language and literature department at Wayne University, has been made a Chevalier of the Legion of Honor by the French government, Henri Bonnet, French Ambassador to the United States, has announced.

The award, one of France's highest, was established by Napoleon I and is given only rarely to citizens of nations other than France. It was presented to Dr. Borglum for his work in devising a new method of teaching French at Wayne University with films and recordings supplementing textbooks.

♦ Nelson A. Hauer, head of the department of industrial education, Louisiana State University and Agriculture and Mechanical College, Baton Rouge, La., is on leave from the University for two years to accept a position as consultant in Technical Vocational Education in Lebanon for the Foreign Operation Administration in co-operation with the U. S. Office of Education.

♦ The three graduate fellowships in industrial arts awarded by Ball State Teachers College through the industrial-arts department for the school year, 1954–55 were made to the following: Howard T. Harris, who comes from the Teachers College at Millersville; Robert J. Neuneker, who received his baccalaureate degree at the Teachers College, Macomb, Ill.; Bernard Wilder, who hails from the State Teachers College at Buffalo, N. Y.

These men are responsible for the supervision of extra laboratory work periods and occasional instruction in the laboratory school and some of the courses on the college level.

♦ Charles Shoemaker spent the summer at the University of Maryland continuing his work toward his doctoral degree.

♦ Bernard R. Josif, assistant professor in the industrial-arts department, Ball State Teachers College, Muncie, Ind., is on a year's leave of absence to continue his graduate work at the Illinois Institute of Technology in Chicago.

♦ Richard Ahern has been appointed assistant professor in the division of architecture of the Industrial Arts Department at Kent State University, Kent, Ohio.

Mr. Ahern is a graduate of Massachusetts Institute of Technology, and holds the degree of doctor of technical science from Technische Hochschule in Graz, Austria. Until recently he has been with an architectural firm in Washington, D. C.

♦ Charles Keith has been appointed instructor in the department of industrial arts, Kent State University, Kent, Ohio. He holds a bachelor's degree from Ohio State University and a master of arts degree from Michigan State University. He has been a teacher in the East Lansing public schools, East Lansing.

♦ Walter W. Klausley has been appointed state supervisor of trade and industrial education in the Minnesota State Department of Education, vocational department.

♦ Willard J. McCarthy is beginning his second year as instructor of industrial education in the Murray State College, Murray, Ky. Mr. McCarthy completed the master's degree in industrial education at the University of Illinois in the summer of 1954. His undergraduate work was done at the Stout Institute.

THERMODYNAMICS AUTHORITY DIES

Dr. Max Jakob, 75, one of the world's foremost authorities on heat transfer and thermodynamics, died suddenly of a heart attack on January 4 at his home in Chicago.

He had served since 1937 as research professor of mechanical engineering at Illinois Institute of Technology and consultant in heat research at Armour Research Foundation, an Illinois Tech affiliate.

Jakob's heat transfer laboratory, which he founded at the institute in 1942 and developed into a center of graduate research, attracted students from all over the world.

He came to the United States in 1936 after fleeing from Nazi Germany. He continued research investigations in this country in fundamental and applied studies of boiling, free and forced convection, fluidized beds, radiation, conduction with internal heat development, regenerative heat exchangers, windshield defrosting and thermal anti-icing, extended surfaces, two-phase flow, hypsometry, sweat cooling, convection in annular spaces, and many other branches.

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SHEET-METAL PIPE LAYOUT

(Continued from page 146)

line and go through the same procedure to obtain the other half of the curve.

On Fabricated Pipe

a) Scribe a right circumference on the pipe as though you were going to cut it off square. This acts as the base line.

b) Set a pair of dividers at *0.174 times the pipe radius and* mark off 36 divisions on the right circumference of (*a*). (The number, 0.174 is from arc-cord tables.)

c) From any marked off point as a starting point, measure lineally along the pipe each of the values for Y in turn. This takes you halfway around the pipe. Then go back to the starting point and go around the pipe in the opposite direction, to complete the circumference.

News Notes

♦ The first state college in Wisconsin to offer training in driver education, The Stout Institute, Menomonie, has won national recognition from the American Automobile Association. The college was recently awarded a plaque to commemorate its 15 years of success in operating a driver education program.

The Stout Institute receives national recognition award of the Automobile Association of America.

From left: B. A. Precourt, safety director for AAA's Wisconsin division; R. F. Kranzusch, director of driver education at Stout; and Roy Van Duzee, director of the West Allis School of Vocational and Adult Education. Van Duzee was the instructor of the first driver education class in the 1939 college summer session.

Stout opened its driver education curriculum in 1939. Since that time, approximately 600 persons have been trained as better drivers. Now both the basic and advanced driver education courses are available.

The basic course is now offered each semester of the college year and during summer sessions. In addition, an advanced course has been added, designed to improve the techniques of practice driving instruction.

Both the basic and advanced driver education courses will be offered at Stout this summer from August 1–12.

♦ Ten points to consider in choosing windows for a home are presented by the University of Illinois Small Homes Council in a new circular, "Selecting Windows."

To be considered are whether the window can be: used to provide daylight in adequate amounts; opened to provide desired ventilation; installed to provide unobstructed view; economically adapted to the construction to be used; fitted with hardware which makes operation easy; closed tightly to keep out rain and cold air; opened without interfering with draperies or furniture; easily fitted with screens and storm sash; easily washed; inexpensively maintained.

"Some windows are better suited to certain wall locations than others," the circular explains. The three basic window types are sliding, swinging, and fixed.

Sliding windows include double-hung and horizontal-sliding. Swinging windows include casement, awning, jalousies, bottom-hinged, and top-hinged. Fixed windows may be combined with operating windows being placed at the side, above, or below.

The circular discusses each type from the standpoints of hardware, ventilation, view, weathertightness, maintenance, and ease in washing. The publication is one of a series resulting from a study of windows under a research grant by the Lumber Dealers Research Council.

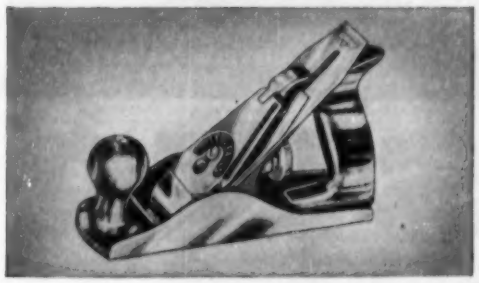
Single copies of "Selecting Windows" will be available free on request to the Small Homes Council, University of Illinois, Urbana, until March 15, after which they will be 10 cents.

♦ Smoke from coke ovens which is now converted into a wealth of basic chemicals used

(Continued on next page)

No. 75 BLOCK PLANE
For working end-grain surfaces. Invaluable, too, for many light jobs cutting with the grain. Short, light, easily controlled.

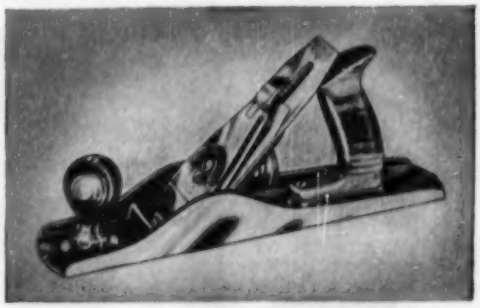
All Favorites



WHEN THEY'RE ALL MILLERS FALLS

No. 9 SMOOTH PLANE
For finishing large surfaces. Improved grip gives more hand room — better balance, control, comfort.

No. 14 JACK PLANE
For edging and all-around use. Quick, easy depth and side adjustments of irons.



Favorites for years with expert craftsmen — Millers Falls Planes are today better than ever in two important ways.

FIRST: All bench models are now equipped with new, scientifically re-shaped handles. The grip is roomier, more comfortable. That means easier handling, better control, less fatigue.

SECOND: All wood parts are now made of colorful Goncalo hardwood — brilliantly grained for new beauty — incredibly durable to withstand a lifetime of rugged use.

In addition, you still get all the time-tested features that have made Millers Falls Planes world famous for accuracy and performance. Write for full details on Millers Falls better-than-ever line of planes for every purpose.

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Dept. IA-10 Greenfield, Mass.

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SINCE 1868

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To teach electronics better—at lower cost...

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EICO KITS are top-quality professional TV/radio/electronic test instruments—embody latest performance-proven design and circuitry. Complete with all components, pre-punched chassis, deep-etched aluminum panel, rugged steel case. "Beginner-Tested" step-by-step instructions help the student learn by "doing it himself"—quickening his familiarity with the construction, operation and maintenance of electronic instruments.

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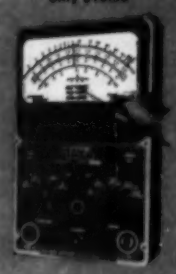
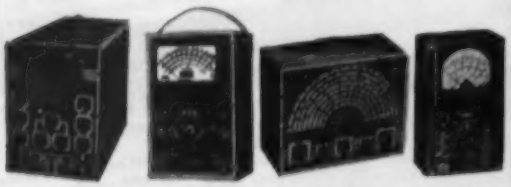
Vacuum Tube Voltmeter
DYNAMIC DEMONSTRATOR
only $10.00





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425K 5" Push-Pull Oscilloscope	221K Vacuum Tube Voltmeter	320K RF Signal Generator	536K 1000 Ohms/Volt Multimeter
KIT $44.95. Wired $79.95.	KIT $25.95. Wired $39.95.	KIT $18.95. Wired $29.95.	KIT $12.95. Wired $14.90.

Prices 5% higher on West Coast.

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SOLDER

NEWS NOTES

(Continued from previous page)

in the manufacture of aspirin, paints, fertilizers, wood preservatives, plastics, nylon, sulpha drugs, and countless other articles is the subject of a dramatic color motion picture, "Waiting Harvest," just released by United States Steel Corporation.

"Waiting Harvest" traces the development of coke-making operations from the early industrial era when black smoke from beehive coke ovens was cast off into the atmosphere to modern coke ovens which channel it into processing units where the important chemical components are extracted.

Prints of this 23 minute motion picture are available on a free loan basis by writing to the *Motion Picture and Visual Aids Section, Advertising Division, United States Steel Corp., 525 William Penn Place, Pittsburgh, Pa.*

♦ In September of 1955, Chicago will become the machine tool center of the world.

Three separate shows, each with an appeal to the industrial arts and vocational school markets, will be conducted there at the same time. These shows are: the National Machine Tool Builders Show at the International Amphitheatre; the Metal Working Machinery and Equipment Exposition at the Chicago Coliseum; the Accessory Show at Navy Pier.

This show will bring together the greatest concentration of machine tools that has ever been gathered together in the past eight years.

♦ The industrial-arts department at Long Beach State College, Long Beach, Calif., has recently been expanded and new shops provided for the areas of woodworking, general and machine metals, graphic arts, industrial drawing, and radio and electricity. Plans have been approved for the development of a transportation area.

These units have been provided with excellent new equipment and are being used for teacher training in industrial education. Plans are also being developed for considerable expansion in the near future.

The program at Long Beach State College is now fully accredited and has recently been approved by the California State Department of Education to give a master's degree in industrial-arts education.

♦ Two new color films on aluminum brazing and welding are now available for free loan to industrial plants, vocational schools, the aircraft industry, industrial arts classes, engineering societies, and other interested community organizations, through the regional libraries of Association Films, Inc.

The films are entitled "New Horizons in Aluminum Brazing," and "Welding Advances with Aluminum," and are presented as an industry service by Alcoa. "New Horizons in Aluminum Brazing" runs 22 minutes, and "Welding Advances with Aluminum," is a 28-minute film.

The films may be borrowed from *Association Films'* libraries in: *Ridgefield, N. J. (Broad at Elm)*; *Chicago (79 E. Adams St.)*; *Dallas (1108 Jackson St.)*; and *San Francisco (351 Turk St.)*.

♦ Pan American Day in 1955, and Pan American Week, will mark the 65th anniversary of the modern Pan American movement, which had its inception in the First Inter-American Conference held in Washington in 1890. It will also be 25 years since the Council of the Organization of American States, then known as the Governing Board of the Pan American Union, in 1930 adopted a resolution recommending that the Governments of the American Republics designate April 14 as Pan American Day, as a "commemorative symbol of the sovereignty of the American Nations and the voluntary union of all in one continental community."

Metal-forming division, of The Cyril Bath Company, of Solon, Ohio, is typical of the environment produced by the use of color according to COLOR DYNAMICS.

Pittsburgh COLOR DYNAMICS®

● Puts color to work to create more pleasant surroundings that improve productive efficiency and morale in modern plant where heavy metal-forming machinery is built!

THE CYRIL BATH COMPANY

We'll be glad to make an engineered color study—FREE!

● Write today for a free booklet explaining how Pittsburgh's COLOR DYNAMICS can be put to work. Better still, we'll be glad to demonstrate the benefits of this painting method in your classroom. We'll provide an engineered color study without cost or obligation. Call the Pittsburgh Plate Glass Company branch nearest you and arrange to have a representative see you. Or mail this coupon.

TODAY EDUCATORS in vocational training recognize that tomorrow's skilled shopmen must have more than a knowledge of machines, methods and metals. They must also know how to put color to work in the plant or the office to turn out more and better work.

● **Pittsburgh's system** of COLOR DYNAMICS is based upon the influence which colors exert on human beings. Tests have shown some colors stimulate, others soothe and relax, while many fatigue, irritate and depress.

● **By using color** according to COLOR DYNAMICS on machines, the operator's attention is focused better on his work. Working parts are distinctly separated from stationary parts and material being fabricated. Eye travel is reduced. All this helps to lessen eye fatigue and nervous tension.

● **Morale-building colors** on walls and ceilings not only improve visibility, but also promote cheerfulness. This improves morale of workers. Safety colors on motorized equipment, cranes and traffic lanes reduce danger of time-loss accidents.

● **Thousands of plants** have been painted the COLOR DYNAMICS way because it is recognized as a distinct contribution to modern production technique. Why not begin now to teach your students the important advantages of such functional use of color?

Send for a copy of this book!

Pittsburgh Plate Glass Co., Paint Div.
Department IA-45, Pittsburgh 22, Pa.

☐ Please send me a free copy of your booklet "Color Dynamics."

☐ Please have your representative call for a Color Dynamics Survey without obligation on our part.

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New Publications

The Art of Tile Setting

By E. W. Carls and L. G. Wines. Cloth, 224 pp., 5¾ by 8¼ in., illus., $3.75. Chas. A. Bennett Co. Inc., Peoria, Ill.

A book of clearly presented directions which will help the amateur to set floor or wall tile in a workmanlike manner.

It contains numerous illustrations which picture how the work is to be done. The book also explains how to prepare surfaces for tiling, how to do wall and floor work, and describes the various tiles that are on the market now, and gives step-by-step directions for setting them.

General Shop Bench Woodworking

By Verne C. Fryklund and Armand J. LaBerge. Cloth, 152 pp., 7⅞ by 10½ in., illus., $3; paper cover, $1.25. McKnight & McKnight Publishing Co., Bloomington, Ill.

A helpful book which has gone through four editions and many reprintings. This is a completely new book and its 76 units acquaint the student with planning how the work is to be done; the method of ordering the lumber; what tools to use; laying out and cutting the stock; using the measuring, marking, and other cutting tools; fitting hardware; and applying stains, bleaches, fillers, paints, etc.

Related information material is interspersed with the practical directions for operational procedures. A good reference list of books by various publishers also is given.

Tests are being prepared for this new edition.

PRECISION MEASURING TOOLS
Showing the complete line including many important new tools
DIAL INDICATORS AND GAGES
Including the complete new line of High Precision — Low Friction Dial Indicators
HACKSAWS, BAND SAWS AND BAND KNIVES
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In a complete selection of 4 types, 295 sizes — air, oil, oil or water and water hardening.
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Presenting the world's most complete line of mechanics' hand measuring tools and precision instruments, dial indicators, steel tapes, hacksaws, band saws, band knives and precision ground die and flat stock. Completely revised and brought up to date to commemorate Starrett's Diamond Jubilee of Precision Toolmaking — including 85 new tools added since the previous edition.

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Dept. CE, Athol, Mass., U. S. A.
Please send my free copy of the big, new Starrett 75th Anniversary Catalog.

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A Rewarding Future for You

Paper, 20 pp., 4½ by 7⅛ in., illus., obtainable free. Armstrong Cork Co., Floor Division, Lancaster, Pa.

A small booklet which describes and illustrates the work of the man who installs resilient floor and wall coverings.

It also explains where training may be obtained, what tools and equipment are required by the mechanic, and under what conditions the worker performs his duties.

Booklets on Regional Employment Conditions

Veterans Administration and the U. S. Department of Labor announces the publication of a new series of nine regional booklets giving information about employment conditions by region, state and city.

So far, five of the pamphlets are available and may be purchased from the U. S. Government Printing Office, Washington 25, D. C. They cover the following sections of the country:

The six New England States, 55 cents per copy.

Middle Atlantic States — New Jersey, New York, and Pennsylvania — 50 cents.

East North Central States — Illinois, Indiana, Michigan, Ohio, and Wisconsin — 60 cents.

West North Central States — Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota — 60 cents.

East South Central States — Alabama, Kentucky, Mississippi, and Tennessee — 40 cents.

A Tale of Two Teachers

By Mark Nichols, 1954 AVA President. 16 pp., 5½ by 8. Single copies free: 10 cents each in quantity (10% discount for orders of ten or more). American Vocational Association, 1010 Vermont Avenue, N.W., Washington 5, D. C.

This booklet presents the story of Ernest Wills and Joe Slokum, their approach to their jobs, and the results of their divergent attitudes.

Delightfully written and illustrated, the story is an object lesson in good teaching techniques and good public relations which covers all aspects of a teacher's responsibility, in the classroom and in the community. It portrays the story of success and failure based on attitudes toward teaching, making a clear distinction between indifferent and superior teaching.

The booklet is interesting and valuable for all teachers, present and future. It's a story you'll enjoy reading and one whose lesson you won't soon forget.

Electrical Equipment You Can Build

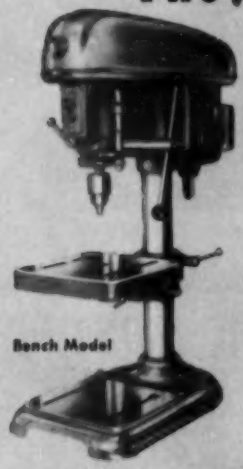
Westinghouse Farm Youth Activities, P.O. Box 2278, Pittsburgh 30, Pa. Single copies free of charge. $4.50 a hundred.

This new 32-page booklet (B-6511), was designed primarily for use in 4-H electric programs and other rural youth programs. The booklet has detailed plans for more than 50 pieces of equipment that can be built and used around the home or on the farm.

The booklet contains plans for indoor and outdoor lighting equipment, shop equipment, signal systems, and productive equipment for the farm ranging from simple brooders and electric hotbeds to a mechanical dairy feeder.

Background information is included for each piece of equipment and easy-to-follow drawings show materials needed and procedure to follow during construction.

Many of the plans in the booklet have been adapted from plans suggested by Extension Service specialists and by power supplier representatives who work closely with 4-H Club boys and girls and other rural youth groups.



The *All-New* DELTA 14" Drill Press

The world's most widely used industrial drill press line now finer than ever!

New in everything but price!

New **IN SAFETY:** Many new safety features such as fully enclosed spindle that has *side opening* for easy changeover, enclosed belt and pulley guard, safety-recessed push button starter up front available as an accessory make the new Delta 14" drill press safer than ever for student use.

New **IN CONVENIENCE:** Quick-set depth gage for faster, more accurate depth of penetration readings . . . Self-locking Depth Stop with micrometer settings calibrated in steps of .002" . . . Tilting Table with positive stops and calibrated scale . . . those are just a few of the new features which make it so easy to do precision work on the new Delta 14" drill press.

New **IN VERSATILITY:** You can teach countless operations on the new 14" Delta—drilling, counterboring, tapping, routing, shaping and dozens of other jobs. You can use it on wood, metal, plastics. In fact, you'll find the new Delta 14" Drill Press one of the most useful and versatile teaching aids in your shop.

Remember, ALL Delta Tools PROVIDE DOUBLY-VALUABLE TRAINING because they are the SAME tools with which many of your students will earn their living after leaving school!

See It Now! There's so much that's new and better about the new Delta 14" Drill Press that you've got to see it to appreciate it. *Call your Delta Dealer for a demonstration (he's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY") or send the coupon.*

DELTA QUALITY POWER TOOLS

Another Product by **ROCKWELL**

DELTA ROCKWELL

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DELTA QUALITY COSTS NO MORE

Delta Power Tool Div., Rockwell Manufacturing Co.
402D N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send me the name of the nearest Delta Dealer who has the new 14" Delta Drill Press on display.

☐ Please send me complete catalog information on new Delta 14" Drill Press.

Name_____ Title_____

School_____

Address_____

City_____ County_____ State_____

SHOP EQUIPMENT NEWS

(Continued from page 40A)

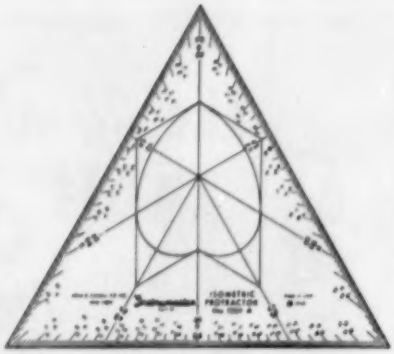
maple top. A graph shows the glue bond obtainable with laminations of various widths.

A copy may be secured upon request.

(For Convenience Circle Index Code 0409)

ISOMETRIC PROTRACTOR

The well-known "Instrumaster" line of Axonometric Drawing Equipment (isometric and dimetric) has been extended to include a new type of protractor for isometric drawing, Cat. No. 1201-A. This protractor contains two sets of 180 deg. graduations, each numbered from zero to 90 deg. clockwise and counterclockwise from the main axes. Either half may be used for any one of the three isometric planes. A geometrical figure around the center of the protractor facilitates orientation of the instrument within the particular plane. The protractor has an outline of triangular shape in such relation to the graduations that by placing one of its edges against the T square, straightedge or drafting machine blade the correct orientation is automatically obtained. A special feature is the provision of two sets of numerals, so that the figures can be read directly, no matter with which side the transparent protractor is placed on the drawing. With this instrument any angle in any plane of the isometric drawing can be plotted or measured directly so that lines not parallel with one of the axes may be drawn without resorting to "boxing" or to the use of co-ordinates.



Isometric Protractor

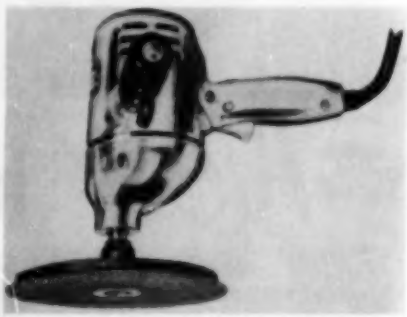
For further information, write to John R. Cassell Co., Inc.

(For Convenience Circle Index Code 0410)

BLACK & DECKER 7-IN. SANDER-POLISHER

A new 7-in. Sander-Polisher having great appeal to the small shop, school shop, home owner, farmer, and professional craftsman has been introduced by The Black & Decker Mfg. Co.

This Sander-Polisher will be particularly appealing to those sanding down siding prior to the repainting of a home, polishing of automobiles, furniture, kitchen counter and school desk tops, etc. A wide variety of accessories are available to expand the use of this tool.



New 7-in. Sander-Polisher

Net weight of this new Sander-Polisher is 6⅝ lb. while the over-all length of the tool is 7⁹⁄₁₆ in. It is supplied with a 6½ in. diameter rubber backing pad, polishing pad, three sanding disks (coarse, medium, and fine), reversible side handle, clamp washer, 3-conductor cable and plug, instant release trigger switch that can be locked *on*, and a 115-volt Black & Decker-built *universal motor* for operation on a.c. or d.c.

The spindle of the Black & Decker 7-in. Sander-Polisher is equipped with a ⅝-in.—24 thread permitting a wheel arbor to be mounted for driving grinding or buffing wheels and B & D wire wheel brushes. Also, a ⅜-in. geared chuck or a 3-in. Wire Cup Brush can be threaded into the spindle. Other accessories available for use with this tool include new, improved Vitri-Glaze for polishing cars, Electric Wax, 5-in. Pile Fabric Pad, and additional grades of sanding disks.

(For Convenience Circle Index Code 0411)

"PRINT IT YOURSELF" PRINTING PRESS

A practical, new addition to hobbies is the "Print-it-Yourself" printing press manufactured by the Sigwalt Manufacturing Company.

(Continued on page 28A)

CASTOLITE PROJECT OF THE MONTH

These industrial, botanical, biological and decorative embedments in Castolite Liquid Casting Plastic are a few examples illustrating the scope and possibilities of this versatile resin. Ball-bearing set and shell paperweight have colored Castolite base.

WHAT IS CASTOLITE? It is a thermosetting, transparent casting plastic. The syrup-like liquid is easily poured into molds of various types. When mixed with a catalyst, it will harden at low temperature and the finished casting is permanent, solid, clear as glass. Once hardened, heat won't melt or soften it — even at 250° F.

Teacher and students embedding wood seeds and insects.

Can Be Sawed, Drilled, Carved Sanded and Polished

Handled as easily as hardwood or soft metal and can be worked with hand or power tools. BRILLIANT COLOR EFFECTS and matching or contrasting color combinations can be produced by merely mixing a few drops of dye with the liquid Castolite. Because of its amazing versatility and unusual workability, Castolite is suitable for the grade school student while at the same time meeting the exacting requirements of the skilled laboratory technician.

This remarkable resin was originally developed for the embedding of biological, anatomical and botanical specimens. These are permanently protected from any deterioration and can be handled and viewed from all sides. Important pathological specimens, for example, can thus be preserved in perfect condition and used for comparative study by future generations.

An Exciting Handcraft Material

Really distinctive jewelry and gift items are made with simple hand tools, without previous experience and little skill. More than a hundred thousand people have enjoyed the creative fun Castolite provides. Some of them made substantial profits turning out key tags, advertising specialties, and other novelties by the thousands. Many company sponsored Junior Achievement groups are using Castolite as part of their business project.

However, most students, both boys and girls, are mainly interested in creating unusual articles such as candlesticks, tiles, coasters, paperweights, watch charms, book ends, figurines, lamp bases — to name just a few. This craft is highly stimulating and no less fascinating are the delightful decorative and useful gifts that can be produced with clear or colored Castolite.

The smaller articles are naturally easier to make than larger castings. Project cost is as low as 10c and few will exceed a dollar. A little material goes a very long way, especially where jewelry casting is concerned.

Glass-like Castolite, with or without embedments, combines beautifully with wood and various metals including silver and copper. As all other projects of this series, Castolite also ties in with already existing school facilities.

Reprint of Casting Article Is Free

Reprint of the Bick article which appears in this issue (plus additional directions) is free to *teachers* of Industrial Arts Departments. Please write to:

School Dept. D50,
The Castolite Co., Woodstock, Ill.

● Producers and Distributors of Casting, Laminating, Coating and Molding Resins — Serving Industry, Science, the Arts and Crafts

THIS NEW 14" *Logan* LATHE PERFORMS . . .

AND THE RESULTS PROVE ITS SUPERIORITY

On school shop projects as well as in industry, the more jobs you watch this rugged new Logan "6560" perform, the more impressive it looks. On the heaviest cuts, or at maximum speed, it turns the work *smoothly*, quietly, with precision results. Superior performance is literally designed, engineered and built into the "6560".

The Variable Speed Drive provides instant rpm adjustment on work requiring variation of spindle speed. The oversize spindle, with 1⅜" bore, turns on a ball bearing mounting that needs no adjustment within the full range of 38 to 1200 rpm. The bed is a wide, deep special alloy casting, extra heavy and resistant to both internal and external stresses. The two V-ways and two flat ways are precision ground. There is extra strength in the wide gears, heavy bearing supports, massive headstock, carriage and base. This extra weight, plus dynamic balancing of the complete lathe practically eliminates vibration. Remarkably moderate price and low cost operation make the "6560" outstanding in economy as well as in precision performance. See it at your Logan Lathe dealer's, or write for Bulletin 14-L, giving a full description.

SPECIFICATIONS AND FEATURES

14⅝" swing over bed
9" swing over saddle
1⅜" spindle hole
1" collet capacity
40" between centers

Variable Speed Drive
Ball Bearing Spindle
38 to 1200 rpm
Two-V-way, Two-flat way
Precision Ground Bed
Precision Carriage

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

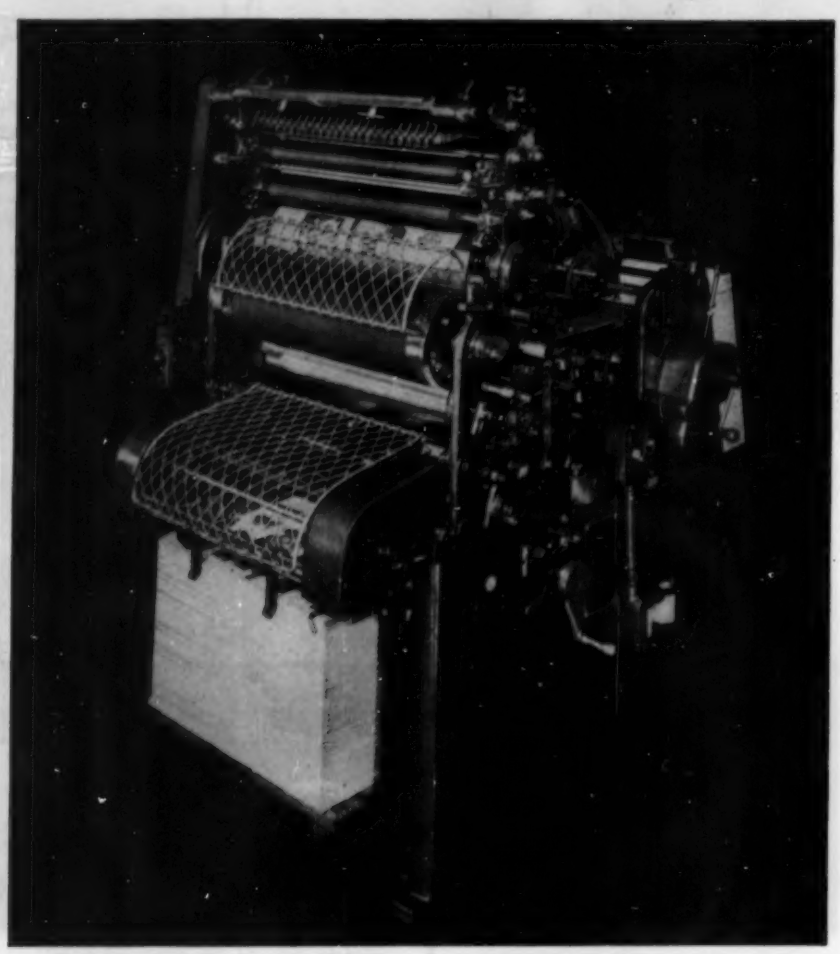
LOGAN ENGINEERING CO.

Lawrence and Lemon Ave., Chicago 30, Ill.

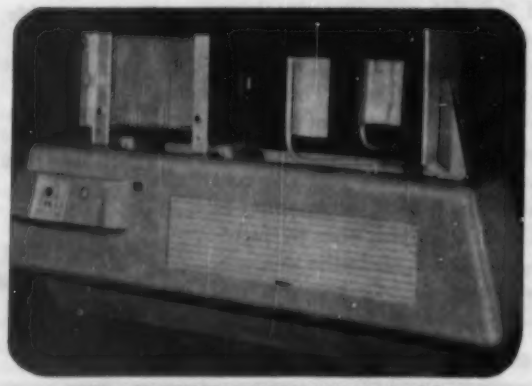
Printing industry *swing* to

ATF CHIEF 20 SPECIFICATIONS

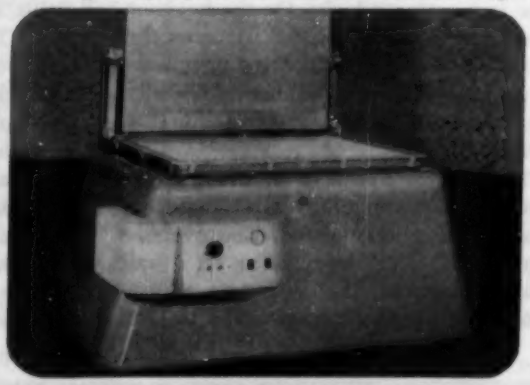
Sheet size limit 8" x 10" to 14" x 20" . . . Feeder capacity 17¾". . . Printing area 13½" x 19½". . . Delivery capacity 14". . . Plate dimensions 15½" x 20½". . . Stock range 9 lb. . . . Onion skin to 4 ply . . . Speed range 3200 to 5500, variable . . . Dampening rollers 5 . . . Inking rollers 12 (two form rollers).



New ATF Camera and Platemaking equipment rounds out your



NEW ATF MASTERCRAFT CAMERA simplifies focusing, diaphragm and illumination control.



NEW ATF MASTERCRAFT PLATEMAKER combines printing frame, rub-up table, and stripping table.

offset poses training problem

ATF Chiefs plus new platemaking facilities help you train more students faster

With 70% of new printing equipment sales going to offset plants, shortage of trained offset printers is getting worse every day!

So says a recent Printing Industries Association survey, endorsed by T. A. Dunwoodie, President of the Printing Pressman's Union. The industry must *double* its training efforts just to maintain the level of its present work force—without allowing for expected expansion in the field.

This calls for redoubled efforts on the part of graphic arts schools – and that's where ATF can help. Our Chief 20 across the page (or 22) are perfect presses for teaching offset. Small and modestly priced, they're easy to master, turn out top-quality work.

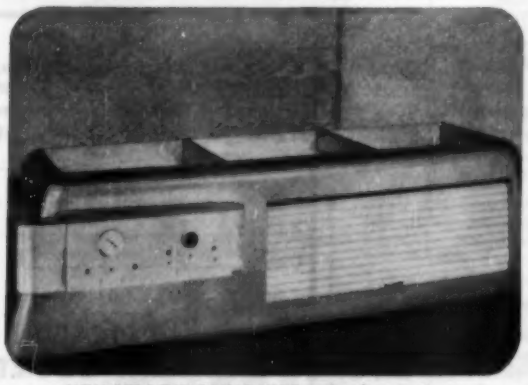
And ATF's new low-cost camera and platemaking equipment bring this end of offset instruction within (press, camera, developer, platemaker: approximately $10,000) the reach of most schools. Write ATF Educational Service Department for the new booklet "Planning your Offset Department" and your reprint of MODERN LITHOGRAPHY's "Will There Be Enough Manpower?" American Type Founders, *a subsidiary of Daystrom, Inc.*, 200 Elmora Avenue, Elizabeth, New Jersey. SE.4.6

BETTER, MORE PROFITABLE PRINTING FROM THE WIDEST LINE OF PROCESSES

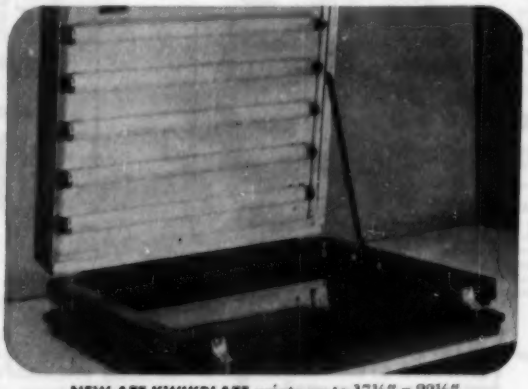
Gravure...Letterpress...Offset

ATF

offset department program

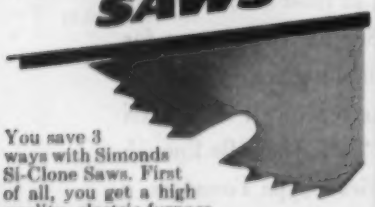


NEW ATF DEVELOPING UNIT maintains constant water temperature for developing negatives.



NEW ATF KWIKPLATE prints up to 17½" x 22¼" offset plates quickly and easily.

Cut Your Saw Blade Bill with SIMONDS SI-CLONE SAWS



You save 3 ways with Simonds Si-Clone Saws. First of all, you get a high quality, electric furnace alloy steel saw at popular price. Second, you get longer service between sharpenings because Simonds steel holds a keen edge longer. And finally, you get smoother, straighter cuts that need less finishing, save time, mean better work.

What's more, you have a choice of 13 types of saws up to 12" diameter for specific cutting needs, for use on all standard table, radial arm or portable electric hand saw machines.

Get these money-saving saw blades from your hardware or mill supply dealer . . . send for Catalog "B".

Rip, Cut-off and No. 60 Comb.

6"	$1.75
7"	2.00
8"	2.15
9"	2.65
10"	3.15
12"	4.35

Supplied with round or special shape holes

GUARANTEE
Made of Simonds steel fully guaranteed against any defect in material or workmanship.

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.
Factory branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.

SHOP EQUIPMENT NEWS

(Continued from page 24A)

"Print-It-Yourself" Printing Press

Although miniature sized, Sigwalt presses are not toys but precision equipment capable of turning out professional quality business cards, letterheads, menus, labels, price tags, envelopes, statements, tickets, and countless other items. The profit angle inherent with these new presses has made them particularly attractive to many adults as well as thousands of youngsters in the hobby and do-it-yourself field.

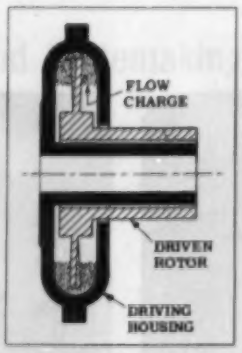
They are available in a variety of sizes in single and double roller models. They come complete with accessory equipment such as metal type fonts, professional type job sticks, type tweezers, ink, wood furniture, and instruction booklets. Rubber type kits for printing on plastic, metal, lucite surfaces are also available.

Smaller models are constructed with chases which print areas of 2¼ by 4 in., and larger presses feature larger chases which print up to areas of 6 by 9 in.

(For Convenience Circle Index Code 0412)

THE DODGE FLEXIDYNE DRIVE

A new development in industrial power transmission, called Flexidyne, and described as a *dry* fluid drive, is announced by the Dodge Manufacturing Corporation as the latest addition to its line.



Dodge Flexidyne Drive

Based upon a completely new principle, Flexidyne easily handles difficult starting and reversing problems, and gives a new kind of protection against shock and overloads. Its major advantages over any other fluid type drive are based on the fact that at normal operating speeds it does not slip. At the same

(Continued on page 30A)

LET THE REVIEWS DO THE TALKING!

REVIEWS are objective appraisals by acknowledged impartials, so...

AMERICAN TECHNICAL SOCIETY'S DRAFTING

Giachino-Beukema

$3.80

. . . a basic course in drafting that is complete and informative. The student will find material useful and practical and in conformity with current practices in industry.
New Jersey Newsmagazine

. . . an interesting approach to the teaching of mechanical drawing. Teachers will have difficulty in finding a book that will be more suitable as a text in general drafting.
School Shop

MACHINE SHOP OPERATIONS AND SETUPS

Porter-Lawshe-Lascoe

$5.50

An excellent text, the writing of which was preceded by a number of surveys to discover the needs of the students and teachers who would make use of the book.
Industrial Arts and Vocational Education

The authors . . . have designed this book to meet the specific requirements of modern instruction in machine shop techniques.
Machinery

Gentlemen:
Please send me on 30-days examination the book(s) checked below:
☐ American Technical Society's Drafting
☐ Machine Shop Operations and Setups
Name.....
School.....
Address.....
City.....
Zone..... State.....

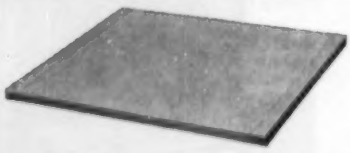
AMERICAN TECHNICAL SOCIETY
Dept. W-218
848 East Fifty-Eighth Street
Chicago 37

Professional performance... for school budgets

A NEW POST BASSWOOD DRAWING BOARD

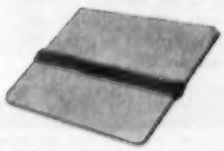
POST—maker of the world's finest drawing boards —knows how to achieve economy at no sacrifice in working quality!

Post's extensive woodworking facilities now enable you to achieve substantial savings in your basswood drawing board purchases. In "working" qualities—smooth flat surface . . . accurately squared edges . . . strong, durable, non-warping construction—Post's new #7253 board is *identical* with the finest, yet priced to meet educational budgets.



Professional grade basswood
Finest clear white basswood, carefully selected and scientifically seasoned. Skillfully manufactured with electronic bonding construction for super-strength and non-warp, accuracy. Fine, smooth-finished surfaces on both sides, free from hard spots, absolutely white surface!

Lightweight "AIRLITE" board
Easier to use, easier to handle, easier to carry! Special lightweight materials. Basswood frame . . . top and bottom single surface panels of seasoned, select, top quality basswood. Rigid, non-warp accuracy combined with lightweight convenience!



Compact "PARALTILT" board
Lightweight, compact—easily portable. Same board as POST'S AirLite, with clear lacquered surface. Seasoned maple parallel ruling unit with transparent plastic edges. Finger-tip blade control. Collapsible tilting device; suction cups for stability on any surface.

Write for Fact File on these POST boards.

POST

FREDERICK POST COMPANY
3657 North Avondale Avenue, Chicago 18, Illinois

DETROIT • ENGLEWOOD, N. J. • HOUSTON • LOS ANGELES • MILWAUKEE

SHOP EQUIPMENT NEWS

(Continued from page 28A)

time, in the case of an overload, it is slippage which gives protection.

The Flexidyne Drive is made up of a housing, inside of which a rotor is free to turn concentrically. Between the two are fine particles of spherical steel shot, called the *flow charge*, which acts very much like a fluid. It is the flow charge which transmits power from the housing to the rotor. This flow charge is easy to seal in, has a high density and can stand relatively high temperatures.

The Flexidyne works as follows:

1. The motor is connected to the housing, and starts it turning at no load.
2. The flow charge is thrown to the circumference of the housing, is compressed by centrifugal force, and revolves with the housing.
3. The rotor, connected to the load, is started and accelerated by the friction and wedging action of the revolving flow charge.
4. Rotor and housing reach identical speeds — the Flexidyne operates with *zero slippage* between motor and load at normal running speeds.
5. Before overloads cause damage, the Flexidyne rotor slips relative to the housing, overcoming the friction and wedging action of the flow charge. A thermal switch (optional) automatically cuts the electrical circuit if an overload persists.
6. The amount of the flow charge determines the torque transmitted.

(For Convenience Circle Index Code 0413)

teach electricity...easily... inexpensively

with **CROW ELECTRI-KITS**

Complete VISUAL-EXPERIMENT equipment with coordinated text for Junior High and High School instruction in . . .

- Electricity for Beginners
- Basic Electricity
- Advanced Electricity
- Electronic Components
- Electronic Circuits
- DC-AC Motors and Generators

Used Successfully by Instructors with No Electrical Experience

1. *Students learn by seeing or doing* . . . they validate electrical principles by constructing their own operating assemblies. Crow method permits students with no mathematical background to grasp the subject readily.

2. Equipment is ready for use immediately in conjunction with your present shop or science courses. No complicated wiring or installation problems . . . no floor space or floor load difficulties.

3. Accompanying each ELECTRI-KIT is a fully illustrated text-manual written in clear non-technical language. It organizes the course for the instructor . . . relieves him of tedious, time-consuming preparation and planning.

4. All parts are precision made and conform to highest engineering standards. They do the work of equipment which, if purchased separately, would cost many times as much, and they do it both safely and accurately.

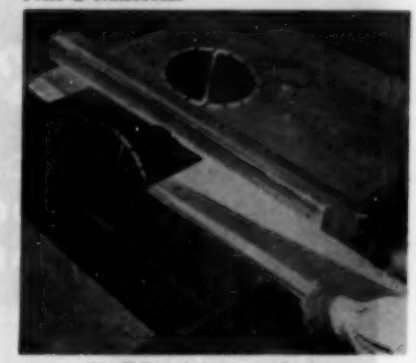
FOR DETAILED BULLETINS ABOUT CROW ELECTRI-KITS WRITE

CROW ELECTRI-CRAFT CORPORATION

Div. of Universal Scientific Co., Inc. • BOX 336G, VINCENNES, INDIANA

PRICE & RUTZEBECK CIRCULAR SAW BLADES

Circular saw blades that are chromium impregnated by a special electrolytic process, and marked under the *Tuff-Tooth* trade name, have been placed in national distribution by Price & Rutzebeck.



"Tuff-Tooth" Saw Blades

They are said to give a minimum service four times that of high-grade, nontoughened blades.

They are recommended for cutting wood, plywood, masonite, and plastic. A complete range of standard sizes, arbored for all popular makes of table, radial arm, and portable saws, is available.

(For Convenience Circle Index Code 0414)

NEW "CAPTAIN'S CASE" PROJECT FOR SCHOOL SHOPS

A new, preformed aluminum construction kit, the Schweizer "Captain's Case" is available for school shop classes. This is one of the do-it-yourself aluminum construction projects developed for junior-high and high school shop classes by the Educational Division of Schweizer Aircraft Corp.

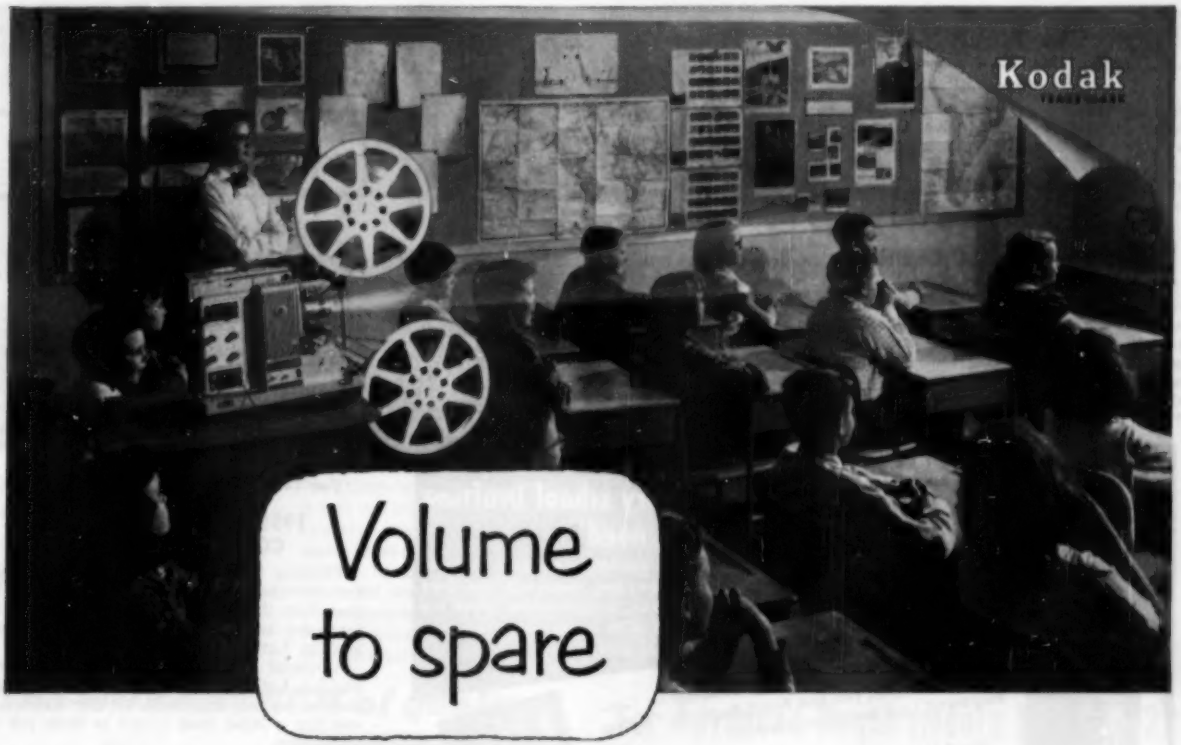
The kit, a large 13½ by 5½ in., makes an attractive, lightweight, and versatile traveling accessory useful as an overnight case, picnic container, book and school supplies carrier, and for many other practical uses.

New Captain's Case Project for School Shops

The case is designed for construction in the school shop with commonly available hand tools. The kit consists of authentic aircraft aluminum materials and includes preformed top, bottom and ends, all hardware, rivets and rivet set, precision blueprints, and simple, easy-to-follow instructions. Teachers also are offered an instruction manual on "Teaching Aviation Construction Techniques" at a nominal cost.

Other kits currently available are a Basic Utility Case, which, when assembled, makes an excellent case for fishing tackle, tools,

(Continued on page 32A)



It's *extra* sound-output that makes this remarkable projector one of the biggest buys in 16mm. sound projection. For the Kodascope Pageant Sound Projector, Model AV-152-S, develops 15 watts of clear, undistorted power. Yet its modest $455 price is considerably *less* than most 10-watt projectors and only $30 more than the standard 7-watt Pageant models.

But what does all this extra power mean to you . . . why do *you* need it? One very good reason is that a movie projector—like your car or any other machine—delivers its finest, smoothest performance when operating at less than full capacity. That's why this Pageant's *reserve* power is valuable even when you're operating the machine at very low volume levels. It means higher fidelity without distortion . . . and less background noise because of the low hum level.

Greater *versatility* is another reward of extra power. The Pageant Model AV-152-S has all the output you need for showings in large auditoriums and hard-to-hear-in rooms—even outdoor assemblies. (And its compact, single-case portability enhances its versatility.)

What's more, this Pageant model has separate bass and treble controls that let you compensate for "boominess" or "deadness" in rooms with poor acoustics. And, as in all Pageant models, a unique Fidelity Control is built in. This makes possible precise focusing of the scanning beam, regardless of sound-track position.

Super brilliant

This single-case, 15-watt Pageant model comes in two versions: a sound-and-silent projector designated Model AV-152-S . . . and the sound-only Model AV-152-SE. The latter machine is equipped with Kodak's remarkable Plus-40 Shutter, which delivers more than 40% extra illumination to provide super-brilliant pictures even under adverse lighting conditions.

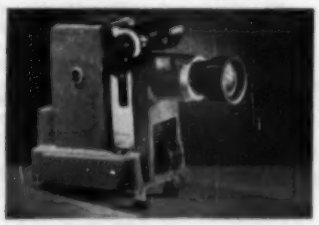
Other Pageant features

There are, in all, six Pageant models. Each is specially tailored to meet specific projection requirements. Yet, they *all* have many outstanding advantages.

Only Pageants, for example, are *permanently pre-lubricated* to by-pass the danger of under- or over-oiling, the major cause of projector breakdowns. A built-in field-sharpening element makes possible super-sharp pictures over the entire screen area. And their operation is always quiet as a whisper.

Ask your Kodak Audio-Visual Dealer for a free demonstration of these remarkable Pageant features. Or mail the coupon for your free copy of a new color catalog on the complete Pageant line.

Prices subject to change without notice.



new Kodaslide SIGNET 500 Projector, Filmstrip Model

It's completely new! And it has the smoothest, surest, fastest film-advance ever designed!

For brighter, sharper pictures, it has the Kodak Ektanon Projection Lens (f/3.5 or f/2.8), 500-watt lamp, *Lumenized* lens-and-condenser system, and aluminized glass reflector. Shows 2 x 2 slides as well as filmstrips.

Only $98, with f/3.5 lens.

WHAT A-V EXPERTS SAY ABOUT PAGEANT PRE-LUBRICATION

"Pre-lubrication of the Pageant assures a maximum of trouble-free service with a minimum of maintenance. This can certainly reduce your yearly maintenance cost. Top-quality sound plus excellent picture performance and quietness in operation makes the Pageant ideal for training—in industry, church, and school."

Robert L. Edwards, Texas Educational Aids, Dallas, Texas

"We know of Pageant Projectors in schools in our area that have been running for three years and more with only a periodic checkup. Permanent pre-lubrication eliminates all the repairs necessitated by too much or too little oil. Pre-lubrication, with all the other features, makes Pageants 'tops in our book.'"

R. H. Sarber, Triple S Camera Shop Ukiah, California

EASTMAN KODAK COMPANY, Dept. 8-V, Rochester 4, N. Y. 4-193

Send name of nearest Kodak Audio-Visual Dealer and information on:

- ☐ **Kodascope Pageant Sound Projectors**
- ☐ **Kodaslide Signet 500 Projector, Filmstrip Model**

NAME_____ TITLE_____

ORGANIZATION_____

STREET_____

CITY_____ STATE_____
(Zone)

SHOP EQUIPMENT NEWS

(Continued from page 30A)

camera equipment, sports gear, and numerous other uses. A bow tie television antenna kit for UHF reception; and a convenient compartment tray for tools, boxes, or odds and ends are other aluminum kit projects introduced by Schweizer.

(For Convenience Circle Index Code 0415)

NEW BENCH TOOL CABINET

Stoner Wood Products Company are marketing a bench tool cabinet which can be installed on your 4-station locker base woodworking bench. This cabinet stores 14 frequently used woodworking tools within easy reach of work station. This equipment will reduce running about the shop for tools, and will give the students time to get more work done.

Bench Tool Cabinet

(For Convenience Circle Index Code 0416)

BRANCH SALES OFFICE OPENED

The Pittsburgh Corning Corporation opened a branch sales office at 57 Bloor St. West, Toronto, Ont., Canada.

E. H. Martin, Jr., formerly manager of Foamglas low temperature insulation sales, has been appointed district manager for Pittsburgh Corning's Canadian sales operations.

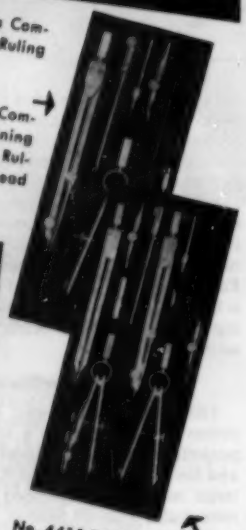
B-G IMPORTED Drawing Instruments

Offered in five sizes to fit every school Drafting Room need

All sets are totally enclosed in sturdy velveteen-lined cases with two flaps (not shown in illustrations) which are secured with heavy snap fasteners. Write for prices.

No. 9311 BEGINNER SET—5¼" Combination Compass with Divider, Pen and Pencil Parts; 4½" Ruling Pen; Metal Lead Box; Screwdriver.

No. 2411 STUDENT SET—5¼" Combination Compass with Divider, Pen & Pencil Parts. Lengthening Bar, 4" Combination Bow Pencil & Pen; 4½" Ruling Pen; Extra Ruling Pen Handle; Metal Lead Box; Screwdriver.



No. 1011 C PROFESSIONAL SET (Solid German Silver)—6" Compass with straightening device, lengthening bar, and interchangeable pen and pencil parts; 6" Hairspring Divider; 3¾" Steel Spring Bow Pencil, Center Wheel; 3¾" Steel Spring Bow Divider, Center Wheel; 3¾" Steel Spring Bow Pen, Center wheel; 3½" Ruling Pen; 4¾" Ruling Pen; Metal Lead Box; Screwdriver Tool; Kit of parts and extra needle points.

No. 4411 DRAFTSMAN SET—5¼" Combination Compass with Divider, Pen & Pencil Parts. Lengthening Bar; 5¼" Friction Divider; 4" Combination Bow Pencil & Pen; 4" Bow Divider; 4½" Ruling Pen; Extra Ruling Pen Handle; Metal Lead Box; Screwdriver.

No. 5411 C ARCHITECT SET—5¼" Compass with Straightening Device; divider part, pen part, pencil part, and lengthening bar; 5¼" Friction Divider with Straightening Device; 4" Bow Pencil, Center Screw; 4" Bow Divider, Center Screw; 4" Bow Pen, Center Screw; 3½" Ruling Pen; Extra Ruling Pen Handle; Metal Lead Box; Screwdriver; Kit of parts and extra needle points.

1955-56 Catalog will be mailed in March

BRODHEAD GARRETT CO.

50 Years Serving School Shops of America

4560 E. 71 ST. CLEVELAND 5, OHIO

Descriptive Material

NEW EQUIPMENT CATALOG

Parent Metal Products recently announced publication of a new 32-page Industrial Arts & Vocational Shop Equipment Catalog.

This new edition contains hundreds of illustrations and descriptions of bench and storage equipment designed for vocational application. Complete sizes and construction information are included with the various items, enabling readers to prepare their own shop layout. Many new workbenches, cabinets, and drawing tables have been added to the Parent Equipment Line.

(For Convenience Circle Index Code 0417)

1955 SHELDON MACHINE COMPANY CATALOG

The new 1955 Sheldon Catalogue illustrates and describes 18 different machine tools. Included in this 24-page book is complete information and specifications on the many new Sheldon Lathes now in production.

A special section on "How to Select your Sheldon Lathe" should prove helpful to purchasing agents and shop superintendents in selecting a lathe most suited to their job requirements.

(For Convenience Circle Index Code 0418)

NEW WESTERN PINE IDEA BOOK

A new 24-page book containing idea pictures both in black and white and in full color has been published by the Western Pine Association.

Entitled "Friendly Home Ideas in Western Pine," the 7½ by 9½-in. publication presents 89 pictorial ideas in woods from the Western Pine Region. These will give many helpful hints to consumers planning building or remodeling jobs.

Single copies are available free of charge.

(For Convenience Circle Index Code 0419)

MACHINING AND GRINDING TITANIUM

The Cincinnati Milling Machine Company has published a 16-page pamphlet, No. M1866, on the subject of Machining and Grinding Titanium. It contains the results of the many research projects which this firm has made on that subject.

For a copy of this valuable pamphlet, write to *The Cincinnati Milling Machine Company*.

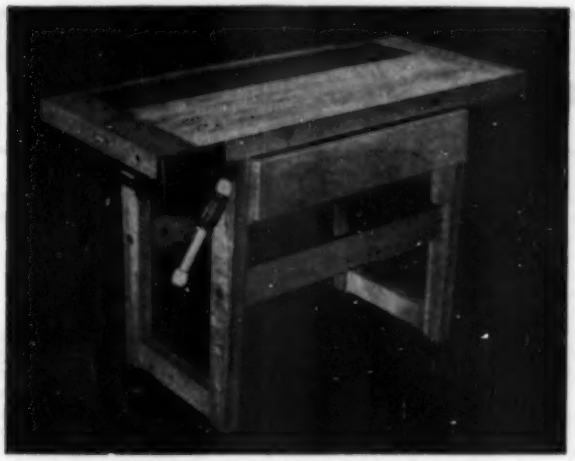
(For Convenience Circle Index Code 0420)

NEW MURPHY CATALOG

A new catalog showing their complete line of "Stay-Sharp" Knives has recently been issued by *R. Murphy Company*, manufacturers of specialized knives for industry, schools, institutions, and special trades. The knives illustrated include roofing knives, paper hangers' knives, skiving knives, rubber knives, shoe knives, replaceable-blade and adjustable-blade knives. Also included are specialized "shucking" knives for opening oysters, clams and scallops, as well as hospital knives and dental laboratory knives. Every "Stay-Sharp" blade is guaranteed free from soft spots, uniformly hardened and tempered to retain its cutting edge indefinitely.

The new catalog may be obtained by writing *R. Murphy Knives Company*.

(For Convenience Circle Index Code 0421)



The Sjöström V-1D Workbench 52" long x 22" wide x 32" high

The V-1, without drawer

The Sjöström V-1D Workbench is built with the same painstaking care which instructors of woodcraft are teaching their students. In addition it is a lesson in practical design and application of sound principles. It is therefore uniquely suited for educational purposes.

The WORKBENCH of quality:

JOHN E. SJÖSTRÖM COMPANY, INC.
1712 NORTH TENTH STREET, PHILADELPHIA 22, PA.

SJÖSTRÖM

You Will Want to See—McKnight & McKnight's

ALL NEW EDITION

GENERAL SHOP BENCH WOODWORKING

PUBLICATION DATE January 3, 1955

By VERNE C. FRYKLUND and ARMAND J. LA BERGE

This is a completely new text for beginning students of any age above the seventh grade.

- Covers the fundamentals of hand woodworking for beginners
- Provides instruction on the basic handtool operations
- 387 illustrations show how to proceed, illustrate information topics, give details of techniques
- New projects
- Contains valuable technical and related information
- Discusses tools, how to use them, types of occupations, sources of wood, processing

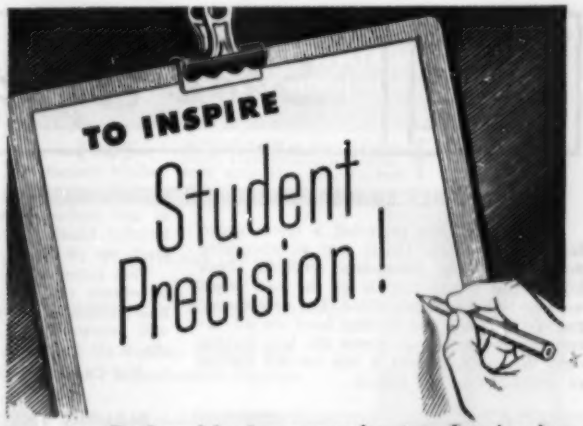
NOW FOR THE FIRST TIME AVAILABLE IN BOTH BINDINGS:

CLOTH BOUND, $3.00 PAPER BOUND, $1.25

CLIP THIS:

McKNIGHT & McKNIGHT, Dept. 257 Market & Center Sts., Bloomington, Illinois
Send me GENERAL SHOP BENCH WOODWORKING
(Check One) ☐ Cloth Bound Edition ☐ Paper Bound Edition
for FREE 30 DAY EXAMINATION. I will either return book in 30 days and owe nothing — or send you full payment.

Name .....
School .....
Address .....
City ..... Zone ..... State .....



Preferred by instructors because they inspire students to new achievements . . . WESTON instruments also are the choice of practical administrators because their ruggedness and year after year dependability make their cost remarkably low! Ask for bulletin listing all instruments.

WESTON Electrical Instrument Corporation,
614 Frelinghuysen Avenue, Newark

For Advanced Requirements MODEL 622

Ultra sensitive instruments of the double pivoted type requiring no leveling when used in horizontal position. Combine high accuracy and a 6.1 inch scale . . . ideal for precise measurements of potential and current at very low energy levels. Available as d-c voltmeters, millivoltmeters, milliammeters and microammeters; electrolysis volt-millivoltmeters and high resistance voltmeters—also as a-c rectifier type instruments and as thermocouple ammeters, milliammeters and voltmeters.

For Electrical Machinery Labs MODEL 633

A clamp-on volt-ammeter built to Weston standards of safety, accuracy and dependability. Five full scale a-c current ranges of 1000/250/100/25/10 amperes with range overlap. Three self-contained a-c voltage ranges of 700/350/175 volts—insulated for 750 volts. Has convenient 6 position switch easily operated by thumb—adjustable pointer stop facilitates measuring starting current of motors.

WESTON

WESTON *Instruments*

Shop Equipment News

NEW DeWALT SHAPER GUARD

DeWalt Inc., has perfected a metal guard for use with their radial arm woodworking machines which completely encloses both knives and motor spindle of the tool when used for shaping applications. The new shaper guard surrounds the cutting head on all exposed sides as well as across the top, leaving only the space beneath it free for the feeding of material into the knives.

New DeWalt Shaper Guard

The new shaper guard is the latest of several such recent safety developments including also a new saw blade guard; a power brake to eliminate "drift" time of the cutting tool; and a starting switch which employs a removable ignition-type key that immobilizes the machine when the authorized operator leaves the shop area, taking the key with him.

The shaper guard will be available for general distribution about April 1, 1955.

(For Convenience Circle Index Code 0401)

STARRETT STAINLESS STEEL DRAFTSMEN'S PROTRACTOR

Strong, light, rustproof stainless steel construction; convenient size; fast, positive setting; accuracy to five minute or one twelfth of a degree — these are the outstanding features of a new protractor with vernier scale developed by The L. S. Starrett Company.

This No. 361 Draftsmen's Protractor lies perfectly flat on the drawing board and locks at any desired setting by means of a single knurled binding nut which also serves as a *knob* for picking up the instrument.

This protractor does not have to be reset to obtain the complement of any angle. A line marked off against the edge of the stock will automatically form the complement of the angle to which the protractor is set.

(For Convenience Circle Index Code 0402)

Starrett No. 361 Draftsmen's Protractor and Vernier Scale

DIALING THE DEPTH OF A HOLE

No need to measure when drilling a hole with the new Shopsmith Mark 5. Just dial the depth desired and swing the control lever that feeds the drill into the wood. Feed stop handle is labeled, as are all handles and controls, to make operation easy for beginners as well as experts.

Manufactured by Magna Engineering Corporation.

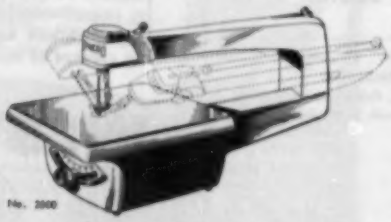
(For Convenience Circle Index Code 0403)

Dialing a hole with the Shopsmith Mark 5

TILTING ARBOR JIG SAW

Syncro Corporation announces the first self-powered jig saw in history to have the tilting arbor feature. The heavy-weight 65-lb. No. 2500 Syncro Tilting Arbor Electric Jig Saw, has a built-in blower, 20-in. throat clearance, and a 12 by 15-in. working surface, giving a full 160 sq. in. working platform. The work on this jig saw is held on a horizontal surface while performing *angle* cuts. It also has a patented "easy" blade changer and is self-powered by a famous patented Syncro reciprocating motor. The "2500" blade also turns 90 deg. in any direction for rip cuts, and the saw can be quickly set for any angle of cut up to 45 deg. on either side of the center by adjusting the conveniently located calibrated dial knob.

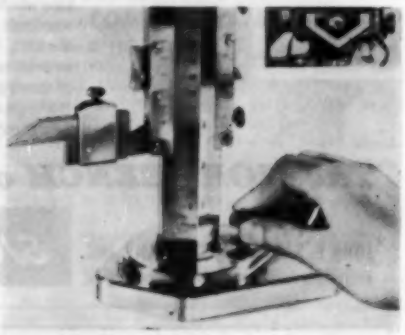
(For Convenience Circle Index Code 0404)



Tilting Arbor Jig Saw

CHESTERMAN HEIGHT GAGE

A differently designed height gage is introduced by the George Scherr Company. Their "Chesterman" Height Gage uses a triangular scale beam for superior strength and rigidity, preventing sway and vibration. This is a real advantage, particularly for layout and checking of large jigs, fixtures, and machine parts. The sliding head is designed to move through its entire range by the action of the full-length, large diameter screw. The engaging nut is split and is disengaged for quick approximate setting of the head by simply pressing the two lugs on the sides and sliding the head along the beam. One of the chief advantages is the location of the fine adjustment screw in the base of the Chesterman Height Gage.



"Chesterman" Height Gauge

The Vernier is 2.450 in. long as compared to the ⅝ in. long vernier commonly found on conventional height gages. Verniers are adjustable and the accuracy of the setting may be checked by use of a master gage block furnished with each height gage.

A large, solid base, heavy enough to prevent tilting or toppling over, assures highest stability and accuracy. Available sizes are 12, 18, 24, 40, and 48 in.

Fully illustrated 6-page folder showing the New Chesterman Height Gages in all details may be obtained from George Scherr Company, Inc.

(For Convenience Circle Index Code 0405)

PECK & HARVEY SPEEDMASTER MODEL "1400C" WHITEPRINTER

The Speedmaster "1400C," a new 44-inch volume-production ammonia-dry whiteprinter, operating on 115 volts, 60 cycle a.c., has been announced by Peck & Harvey Manufacturing Corporation.

This machine offers many advanced features to facilitate plant and office reproduction operations. Prints and develops exact, same size black line and colored line whiteprints in volume as needed, continuously or intermittently. Speeds the availability of whiteprint copies of tracings, drawings, diagrams, sketches,

(Continued on page 36A)

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1955
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July 5 — August 12

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July 5-22: Organization of Industrial Cooperative Programs
July 18-August 12: Curriculum Workshop in Industrial Arts
July 25-August 12: Operation and Conduct of Industrial Cooperative Programs
August 15-26: Driver Training Institute; Administration of Audio-Visual Programs

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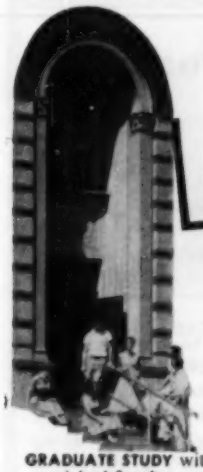

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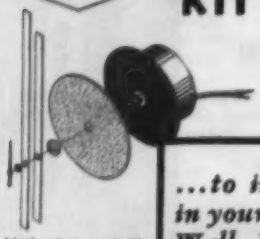

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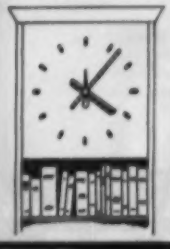

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SHOP EQUIPMENT NEWS

(Continued from page 34A)

Speedmaster Model "1400C" Whiteprinter

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Full details available upon request.

(For Convenience Circle Index Code 0406)

NEW LOW COST CIRCULAR SAW GRINDER

The new Model 3140 Foley Grinder provides a dependable unit for sharpening all types of circular saws — rip, crosscut, or combination toothed — from 5 to 44 in. diameter.

(Continued on page 38A)

Head Can't Fly Off!

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FREE: Illustrated tool catalog

Estwing UNBREAKABLE TOOLS

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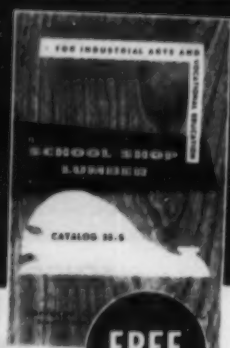
NEW 1955 LUMBER CATALOG



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SHOP EQUIPMENT NEWS

(Continued from page 36A)

Model 3140 Foley Grinder

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(For Convenience Circle Index Code 0407)

NEW KODAK RETINA CAMERA

A new precision-built 35mm. miniature camera well suited to the needs of school groups requiring picture records of their activities has been announced by the Eastman Kodak Company.

This camera named the Kodak Retina IIIc, combines simplicity of operation with advanced optical and mechanical features to meet exacting photographic needs.

The new camera features a built-in exposure meter, a coupled rangefinder, and a unique system of changeable lenses representing a new lens design concept for miniature still cameras. In this lens system a simple change in front components converts the lens from the standard unit into either a wide-angle or telephoto lens. Thus, the camera can be quickly adapted for almost any picture-making situation.

The camera's shutter has built-in synchronization for all kinds of flash bulbs as well as electronic flash. Its speeds range from 1 to 1/500 second. It also has a built-in self-timer.

The Kodak Retina IIIc is equipped with a

(Continued on page 40A)

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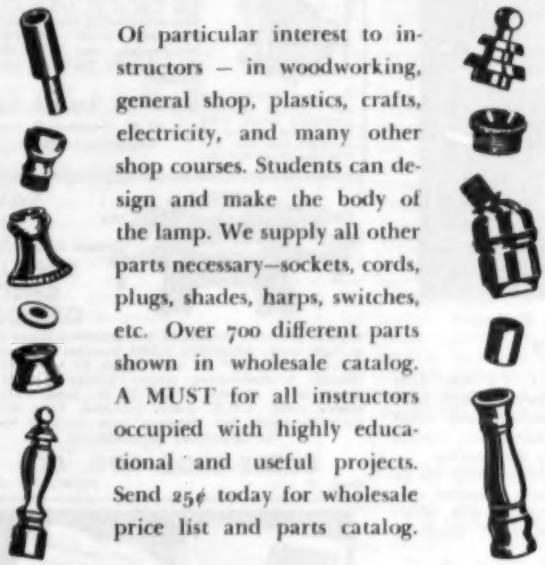

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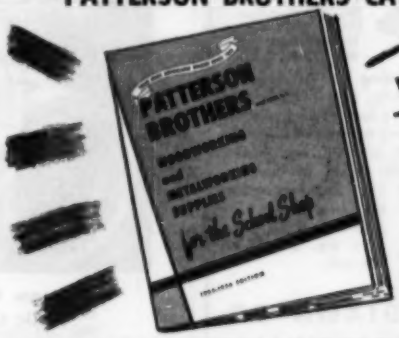

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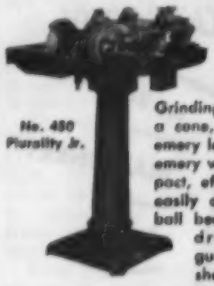

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SHOP EQUIPMENT NEWS

(Continued from page 38A)

The new Kodak Retina IIIc Camera

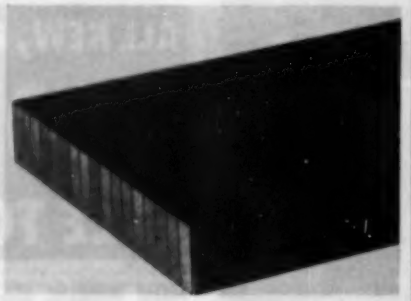
fast, coated, Retina-Xenon C f/2 lens. This permits it to handle shots under difficult light conditions and produce well-exposed color slides when large lens openings are needed with rapid shutter speeds to stop action.

A wide variety of aids are available to go with the camera. These include a leather carrying case; flasholder; telephoto and wide-angle lens components; matched auxiliary viewers, and the like.

(For Convenience Circle Index Code 0408)

LAMINATED MAPLE BENCH TOPS

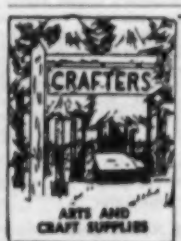
Precision built bench tops is the title of a new 4-page color folder, published by The Tolerton Company, to describe the construc-



Laminated Maple Bench Tops

tion features of Tolco Tops for schools and industry. The folder is well illustrated with pictures, graphs, and line drawings to explain the uses and advantages of a laminated hard

(Continued on page 24A)



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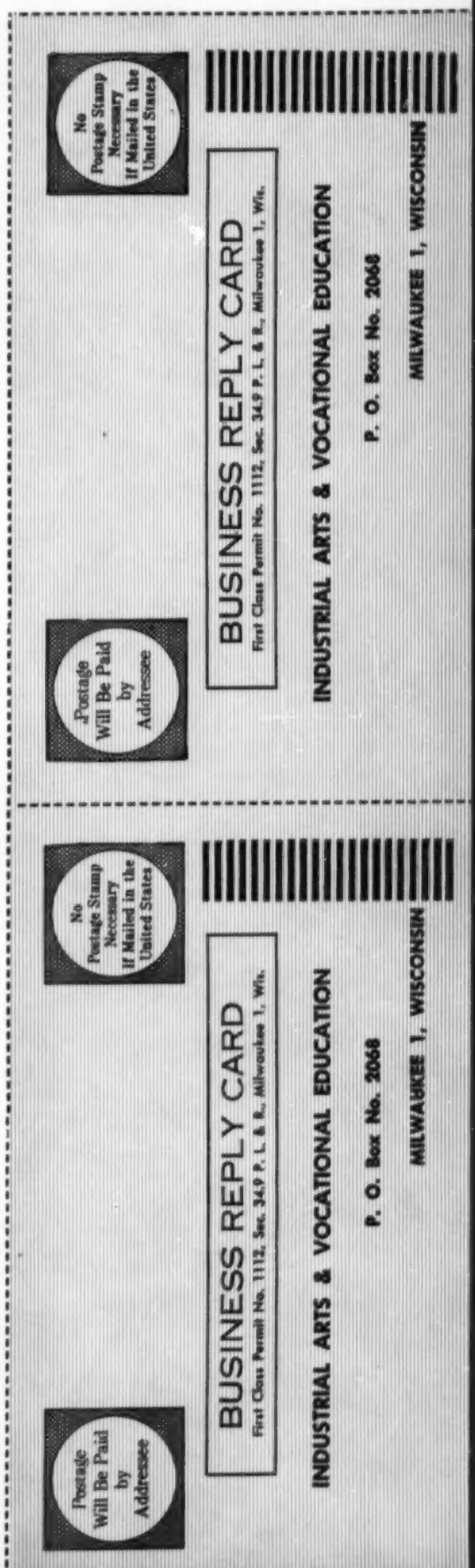
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(as visualized by Tom the Trainee)

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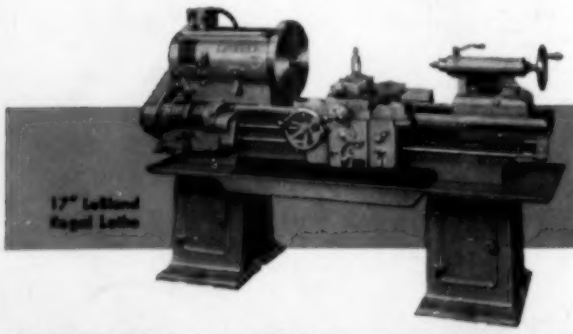
CINCINNATI 8, OHIO



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